

## ARCHIVES OF OTOLOGY.

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### A CASE OF THROMBOSIS OF THE JUGULAR BULB—OPERATION—RECOVERY.<sup>1</sup>

By CARL KOLLER, M.D.

Gertie S., twenty-one years old, was admitted to the Mt. Sinai Hospital on June 30, 1902. After an attack of tonsillitis, she had suffered from pain in the left ear, general headache, and high fever with chilly sensations. Four days before admission, paracentesis of the left drum was performed in the Dispensary, without evacuating any pus.

On admission, there was some tenderness over the mastoid tip, over the posterior part of the mastoid process, and over the antrum. There was also pronounced tenderness along the upper course of the jugular vein, and wry-neck of moderate degree had developed. The drum was not thickened, but was of a pale greenish color, as if a green exudate adhered to it on the inner side, but there was no discharge. Furthermore, the fundus of each eye showed marked venous congestion, which had so much increased by the next day as to leave no doubt that papillitis was developing.

*Operation July 1st.*—A preliminary paracentesis was performed and was followed by considerable serous discharge. After removal of the cortex, a minute quantity of pus was found. The sinus was accidentally opened, being situated very superficially, well forward, and overlapping the antrum. It bled freely, was exposed for about an inch, and was found to be blue in color, and bulged considerably. Some granulations were found in the antrum and the posterior cells, but the cells of the tip were free of pus and granulations. The wound was dressed with iodoform gauze.

The subsequent course, after a short period of improvement,

<sup>1</sup> Case presented before the Section on Otology of the New York Academy of Medicine, at the meeting of December 11, 1902.

was septic in character. The patient complained of severe headache in the left side and occipital region, and of extreme pain in the upper course of the jugular vein. In addition, the papillitis increased so visibly as to deserve the name of choked disc. Blood cultures were sterile.

*Operation July 11th.*—(1) Curettage of sigmoid sinus. (2) Ligature and excision of the jugular vein.

The dura mater of the middle fossa was exposed over the tegmen tympani and over the antrum; it did not bulge, and appeared normal. Then the sinus was exposed in its entire length, going as near as possible toward the bulb; the sinus was thrombosed. Upon curetting, it bled freely from above, but the bleeding from the region of the bulb was not satisfactory. Then the jugular vein was ligated in the neck and was dissected out as high as possible; about  $1\frac{1}{2}$  inches of it was excised; it was not thrombosed. A culture of the thrombus found in the sinus was sterile.

The temperature on the next two days ranged somewhat over  $102^{\circ}$  F. Some tenderness was still present over the wound in the neck and in the upper part of the posterior cervical triangle. On July 14th, the patient complained of severe pain in the head and of pain on swallowing. The general condition was bad; the patient became weaker and paler. When, on July 16th, the gauze packing was removed from the sinus, some pus welled out from its lower end, with a distinct pulsating movement. From now on until July 27th the temperature was almost normal; there was no pain, and the general condition was very good.

On July 27th, the temperature rose again, and from then on remained intermittent; the patient began again to complain of severe headache, but no pus came from the sinus from the direction of the bulb. Now, in the upper third of the posterior cervical triangle, a tender, diffuse swelling appeared, apparently communicating with the jugular bulb, for, on pressing upon the swelling, pus escaped from the lower part of the sinus. On August 4th, an abscess, situated between the deep muscles of the neck, near the base of the occiput, was opened and drained. With the probe one could feel a denuded area on the occipital bone. Fever and pain, however, continued. The presence of another abscess near the bulb of the jugular vein was suspected, and on August 14th this second abscess was searched for and found at a very great depth. It was reached from behind after

trying in vain to find the stump of the jugular from the old wound in the neck.

On August 16th, two days after this last operation, it was noticed that the tongue, when protruded, deviated to the left; the symptoms of hypoglossal paralysis on the left side were all present, and besides, the patient complained of difficulty in swallowing. When the sense of taste was examined, it was found impaired in the posterior third of the left side. The temperature remained high, and the discharge of pus was very profuse for a few days; it stopped suddenly about one week after the last operation. The temperature then became and remained normal, and the patient made a quick recovery. The papillitis cleared up gradually, though it took many weeks to disappear. The hypoglossal paralysis improved more slowly still, and traces of both could be recognized for several months.

This case, which presented a number of interesting features, differs in many particulars from the typical picture of thrombophlebitis of the sigmoid sinus. Its different phases explain themselves most easily, when we assume that it was one of those cases of primary phlebitis of the jugular bulb, lately brought into prominence by Leutert, Jansen, and others. When the sinus is infected in cases of chronic ear suppuration and mastoid disease, the course of the infection, by way of the antrum or the posterior cells, is quite clear; in such cases we find a perisinuous abscess, secondary phlebitis, and thrombosis of the sigmoid sinus. The mechanism of infection must be different in the acute cases, where phlebitis occurs, and mastoid disease has had no time to develop. A probable path of infection is not quite apparent as yet, but the shortest route would suggest itself as the most likely, and that would be directly from the tympanic cavity to the bulb of the jugular, which lies in such close proximity. Perhaps congenital peculiarities predispose an individual to this danger. If we look at our case in this light, the course is easily intelligible. After suffering for two weeks from an acute otitis, the patient presented unmistakable signs of thrombophlebitis: high fever with chilly sensations, sensitiveness to pressure over the course of the sigmoid sinus, but especially over the upper course of the

jugular in the neck. Papillitis rapidly developed, which does not belong to the typical symptoms of thrombosis of the sigmoid sinus, although it is regularly met with in thrombosis of the cavernous sinus. According to Jansen, papillitis is a common occurrence in the cases of primary phlebitis of the jugular bulb. The failure to find at the first operation the positive evidence of thrombosis of the sigmoid sinus or jugular vein, which had been suspected from some of the clinical symptoms of the case, goes far to prove the view of the case mentioned above. There were only slight signs of an affection of the mastoid and no perisinuous abscess; the sinus was of healthy appearance and was not occluded, although there may have been a parietal thrombus. The operation brought no relief.

At the second operation, the sigmoid sinus was found to be thrombosed in its entire length. This may have been due to the packing at the time of the first operation, but may also have been an extension upward of a thrombus in the jugular bulb. It is certain that curettage toward the bulb did not produce satisfactory bleeding, and that after the operation the symptoms continued until the first dressing, when pus escaped from the lower part of the sinus groove, thus establishing positive evidence of the existence of an abscess in the bulb. Then relief came and continued for some time, during which the lowest part of the sinus discharged freely. When this free drainage ceased, a swelling in the neck appeared below the occiput which communicated with the intravenous abscess, as was evident from the fact that, when this swelling was pressed upon, pus oozed from the lower part of the sinus groove. So the abscess in the bulb must have perforated and burrowed under the deep muscles of the neck until it appeared in the upper part of the posterior cervical triangle. Macewen, however, gives another explanation for these deep abscesses. He states that they owe their origin to phlebitis of the condyloid emissary veins. However this may be, recovery did not ensue before I had opened and drained the second abscess, which was still deeper and evidently the original periphlebitic abscess.



In conclusion, I beg to call attention to a number of unusual symptoms connected with the case: first, wry-neck is sometimes found in cases of thrombosis of the jugular vein, and the explanation given by Koerner and others is that, since the movements of the head toward the other side are painful, the head is instinctively held in the wry-neck position to avoid pain. It is hard to understand, however, why this symptom should occur only in a comparatively small number of such cases. Again, at different times in the course of our case we found for a few days difficulty in swallowing. After the last operation, the symptoms of disturbed sensation of taste and motility of the tongue made their appearance, proving a paralysis of the glosso-pharyngeal and hypoglossal nerves on the left side. It is not impossible that this may have been due to injury during the operation, although the writer feels pretty sure that such was not the case. Considering finally that the function of all the three nerves, the ninth, tenth, and eleventh, leaving the skull through the foramen lacerum in close proximity to the jugular bulb, were disturbed, and that the twelfth, leaving through the condyloid foramen, was paralyzed, it may not be too far-fetched to assume that the periphlebitic abscess was responsible for the trouble, just in the same way as we sometimes see facial paralysis in cases of otitis media.

A CASE OF PULMONARY TUBERCULOSIS,  
WITH INTERSTITIAL NEURITIS OF BOTH  
COCHLEAR NERVES, TOGETHER WITH  
PERSISTENT EMBRYONIC ADHESIONS IN  
THE SCALA TYMPANI.

BY PROF. F. SIEBENMANN, OF BÂLE.

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Translated by Dr. W. S. BRYANT, New York.

Elizabeth W., fifty-one years old, was received in the medical service of the City Hospital on May 6, 1901. For fifteen years she had suffered from catarrhal fever, and recently she had had dyspnœa and cough. For the last five weeks she experienced pain in the limbs and had lost weight. Physical examination showed a little dulness and scattered râles at both apices, with an evening temperature of  $38.5^{\circ}$ – $39^{\circ}$  C. and regular morning remission, and greatly increased sensitiveness of the calves without other abnormality. In childhood the patient had had very good hearing, then the hearing slowly failed during the last twenty years. Tinnitus, vertigo, otalgia, and otorrhœa have never been noticed. Her father was very deaf in old age.

On July 4th the following observation was made: Both drum membranes were opaque with prominent posterior folds, no scar, and light reflex absent. Hearing: right ear, *oem* for conversation; left ear, whisper uncertain at ear. When the ear was closed she did not understand. Functional test:  $a'$  was not perceived on the vertex. Rinne  $a'$ :  $A D = 0$ ;  $A S = + t$  only by air conduction. Testing with the continuous scale gives the following results:  $A D$  heard the whistles  $a^2$ – $a'$  and the Galton whistle (Bezold-Edelmann) to 16.5 without a break, and the unweighted tuning-forks  $g^4$  and  $c^4$ ;  $A S$ :  $E_{-1}$  up to Galton 7, with-

out a break. The results did not vary after repeated trials. The limits of tone-perception were clearly defined.

The diagnosis is right total deafness, double nerve deafness (affection of the cochlear branches of auditory nerves?). The patient improved from Aug. 17th to Sept. 16th, when she became comatose and died on the following day without having regained consciousness.

*Autopsy.*—Disseminated tuberculosis of the kidneys; calcification of both apices. Œdema of the lungs, bronchitis, pleurisy, with adhesions on the right. The kidneys, the lungs, and intestines were as follows: Adrenals normal. Left kidney: capsule slightly adherent; surface covered with grayish-yellow dots, the size of a millet-seed; the ground color dirty yellow. On section, the whole cortex and the columns of Bertini were covered with similar nodules. The Malpighian pyramids were grayish-red without centres. Right kidney somewhat lobular—otherwise the same as left. Both pelves pale—otherwise normal. Lungs: Left lung adherent at the apex—otherwise free, large, and heavy; surface smooth. Calcifications the size of a pea in the apex. On section, much reddish fluid; the mediastinal lymph glands large as beans, slaty on section. Bronchial mucous membrane reddened and covered with froth. Right lung adherent everywhere. In the upper lobe there was an area the size of an apple filled with areas of calcifications—otherwise like the left lung. In the lower lobe there was a bright red granular area. The intestines were normal.

*Temporal Bones.*—Dissection of the petrous bones was made shortly after death, in order to get a good histological examination. Both drum membranes showed slight opacity. The right had an indistinct posterior fold. Both auditory nerves appeared normal macroscopically. The naso-pharynx and orifices of the Eustachian tubes were normal. The mucous membrane of right drum cavity was slightly thickened and pale throughout. Marked swelling of the mucous membrane in the fenestræ, the head of the stapes scarcely protruding. A drop of pus at the bottom of the drum cavity. The tube was normal. The mastoid process very pneumatic.

*The Left Ear.*—The mucous membrane of the middle ear was normal; no discharge on the floor. The stapes was removed from the left petrous bone, and both petrous bones immediately after the dissection were put in formalin-Mueller's fluid for a month, and then imbedded in celloidin.

*Microscopic Examination of Right Ear.*—Moderate swelling and round-cell infiltration of the mucous membrane of the middle ear most marked in the folds of the round window. The stapes plate slightly thicker than usual—otherwise normal. All the ossicles and joints were normal, also the wall of the labyrinth.

*Labyrinth.*—The trunk of the acoustico-facial nerve, stained in hematoxylon-eosin and cut lengthways, showed, on superficial examination, no quantitative or qualitative change. In the cochlear branch, groups of nerve fibres were observed, after careful examination, somewhat separated from each other in certain regions; in other places, dense and fine fibrous tissue was seen between the bundles of nerve fibres arranged in longitudinal wavy lines, which were but slightly stained and had very few nuclei. Stained after Weigert-Pal these fine fibres remain unstained. With a fuchsin-picric-acid stain they are stained light red like periosteum and the connective-tissue part of the arteries in the porus acusticus. These nerve changes of the cochlear nerve are chiefly limited to the inner third of the meatus auditorius. Towards the labyrinth they quickly decrease from the spot where the nerve divides into its branches before entering the lamina foraminulenta, and are only marked in a few of the little branches which pass to the lower part of the basal turn. The size of the normal compared to the changed area is indicated in Figs. 1 and 2. This is taken from sections Nos. 60 and 63 where the change was most pronounced, and the interspersed layers of connecting fibres were the thickest, while in the rest of the series of longitudinal sections it was less noticeable. The posterior central part of the nerve trunk is noticeable, as is seen on Fig. 2, where the facial nerve is cut at right angles and appears brownish-yellow, and is free from these red connective-tissue elements, except for the normal peri- and endo-neurium. The perineurium is normal; the

nuclei of Schwann's sheath as well as the vessels are not much increased nor otherwise changed. There is neither an increase of leucocytes nor pigmentation. In the sections stained by Weigert-Pal, the whole cochlear nerve appears lighter-colored than the vestibular or facial nerve, and even the apparently sound nerve-fibres do not have a normal color-reaction. In the modiolus, the nerve-fibres and ganglion cells are reduced from one third to one tenth their normal size. The ganglia are somewhat more affected than the nerve fibres, while there is no increase of connective tissue in the course of the nerve in the cochlea. The remaining nerve fibres seem to be qualitatively normal except that they decolorize very rapidly by the Weigert-Pal method. The ganglion cells are also very little changed. But with a higher power remarkably poorly stained ganglion cells appear singly and in groups. Instead of the nucleus with a dark nucleolus, they contain a light-colored granular central mass, not clearly outlined or differentiated, or empty spaces. Vacuoles could not be found. The degenerated cells are varicose rather than decreased. All the whorls of the cochlea are affected, apparently the least so in the upper half of the middle and upper whorls (Fig. 2). We must allow, however, that here in the normal condition the ganglia and nerves of the lamina spiralis are densest. The nerve structure of the apparently normal parts of the trunk is in some places indistinct, and in the modiolus the nerve fibres are more distinctly outlined. The scala vestibuli, with the finer structures of the ductus cochlearis, is normal, except one place in the bottom part of the cochlea, where the lamina spiralis, with the ligamentum spirale and Reissner's membrane, shows an altered development which is described below. The vestibular nerve is unchanged, both as regards its ganglia and terminations and the vestibular epithelium.

A further remarkable change occurs in the lower section of the scala tympani, as the lower half of the basilar whorl, as far as the round window, is filled up with loose areolar or embryonic tissue, containing in part bony tissue. Fig. 3 shows the relations in the neighborhood of the round window. The obliteration is here so complete that it resembles



the condition in the fourth month of gestation, when the membrane of the round window and the spiral membrane are already differentiated, but are still continuous with the loose contents of the scala tympani. The spiral ligament is defined below and inward by a fine bony plate against the contained tissue, but is adherent to it on all sides. A small space occurs immediately under the spiral membrane. Somewhat farther up—that is, somewhat nearer the upper end of the ductus cochlearis—the closure is complete; the inner wall of both scalæ juts forward and is limited by a thicker bone plate than normal towards the perivascular space of the modiolus. Osteophytic deposits occur on the lower surface of the spiral membrane, and at the bottom of the scala tympani they appear like fibrous medullated connective-tissue bone. Bone tissue also occurs in some places in the ligamentum spirale, whose lower half is here no longer distinctly defined from the “contents.” This is rich in bone corpuscles, and stains bright red with hæmatoxylin-eosin in contrast to the bluish bone of the labyrinthine capsule. It contains no interglobular spaces. The ligamentum spirale extends abnormally far, not alone downwards but upwards. It covers the upper wall of the scala vestibuli in some places as a thick layer, and passes at the inner wall directly into the connective tissue of the large perivascular lymph spaces of the vessels in the partition. Reissner's membrane is very much thickened and deeply pigmented. The sulcus externus is flattened in some places by abnormal elevations of Claudius's cells. The organ of Corti does not rest on a firm membrane, but directly on the confused loose fibrilli of the tympanic contents. At the border between the last and next to the last eighth of the basilar whorl—that is to say, below the position of the sulcus internus and membrana spiralis—the contents diminish, and there appears a lamina of normal connective-tissue supporting the epithelium. The free space in the scala tympani then continues to widen and the bony spicules disappear and the inferior-inner border of the spiral membrane is free, allowing it to resume its narrow form. Somewhat above the upper end of the lower third of the basilar whorl we meet normal conditions. An abnor-

mally high ligamentum spirale towards the upper wall of the scala vestibuli and an unusual breadth of the perivascular partition spaces show here, as well as at a half turn farther up, that the arrested development extends farther up than the abnormal filling of the scala tympani with connective tissue. It is remarkable that Corti's organ shows no definite change in the lower part of the cochlea and that the aqueductus cochleæ contains no connective tissue, but passes from the scala tympani back and down through the bone with a clear lumen.

*The Left Ear.*—Middle ear normal. In the nerve we find the same changes as in the right—that is to say, in the trunk ganglia and branches of the cochlear nerve. The total atrophy, however, appears somewhat less. The cochlear trunk is somewhat thicker, and the connective-tissue proliferation is somewhat less. This occurs, as in the right petrous bone, most marked immediately behind the spot where in the fundus meatus the cochlear trunk begins to divide into bundles for the basal whorl. Some of them are changed for the most part into connective tissue up to the point where they enter the lamina foraminulenta. Backward toward the common acoustic trunk quite a number of smaller connective-tissue bands lie scattered in the cochlear nerve. Some large isolated gaps at the central end of the acoustic trunk are filled with bright flakes (excreted myelin) and a few homogeneous amyloid bodies. These spots I have called pseudo-degenerative centres. They occur not only in the neighborhood of the section but also farther up. They are due to splitting and tearing of the single fibres, which occurs as post-mortem change and as the result of faulty manipulation in separating the acoustic nerve from the brain. In the lower half of the basilar whorl there occurs the only abnormality, very wide perivascular spaces in the anterior and posterior spiral veins and for the radiating partition vessels, and a greater elevation of the ligamentum spirale, sometimes as high as to the inner wall of the scala vestibuli. The aqueductus cochleæ is filled for the most part with areolar connective-tissue.

The changes in both ears are as follows:

1. Slight cloudiness of both drum membranes.
2. A non-perforative (terminal) middle-ear suppuration on the right.
3. Closure of the lower end of the scala tympani by bony connective-tissue and thickening of the bony foot-plate of the stapes like a monstrosity of the right ear.
4. Interstitial neuritis of both cochlear nerves.

The slight cloudiness of both drumheads is probably due to former mild middle-ear inflammations. The right middle-ear suppuration must be considered a simple localized disease in connection with the bronchitis, because there is no marked reaction and there are no changes characteristic of tuberculosis. This condition had probably not existed at the time of the examination of the ear—that is to say, two and a half months before death. Neither change can explain the extreme deafness.

The occlusion of the lower end of the scala tympani must be considered as an arrest of development and not as the result of a former inflammation in extra-uterine life, as there are no signs of destruction or change in position, which follow the perforation of the round window or the invasion of a meningitis along the aqueductus cochleæ. There is only a disturbance or an omission of the resorption of the loose connective-tissue, occurring normally in the fourth foetal month, which covers the primitive ductus cochlearis. We know that in those places where connective tissue forms dense bands there is no such resorption, but mostly a change into bone. Normally this change is observed in the modiolus and the inner part of the partition walls. Exceptionally, however, in this case the connective tissue of the lower part of the scala took part in the ossification, being apparently too thick to be absorbed. This is unquestionably not the result of an inflammation occurring after birth from the disturbances in the formation of the bony capsule of the cochlea, which appear also in the other ear, and cannot be referred to previous inflammation. These disturbances are an abnormal width of different vascular channels, a persistence of embryonic connective-tissue contents of the aqueduct, and unusually high extent of the ligamentum

spirale. The thickening of the foot-plate and the unusual height of Claudius's cells in some places can be considered as congenital abnormalities.

It would be interesting to know to what extent this congenital deformity has affected the hearing. This cannot be determined because of the many complications present in this ear. We must not rely too much on the statement of the patient that in her youth she heard well with both ears, because experience teaches us that unilateral congenital deafness, and even one-sided loss of hearing, is sometimes discovered only by chance, and only in adult life.

The most interesting change in both ears, observed and confirmed by autopsy, concerns the cochlear nerve, which on both sides presents the picture of interstitial neuritis (sclerosis). These findings in the acoustic nerve, as far as I know, have only once before been described after pathological examination, and that was by my former assistant, Dr. Sporleder.<sup>1</sup> The case was that of an old woman from the Home at Bâle, who became deaf in one ear after abdominal typhus, and later, after influenza, lost the hearing in the other ear. The post-mortem examination of the first ear showed extensive connective-tissue degeneration of the cochlear and vestibular branches, as well as a marked diminution of the cells of the cochlear ganglion, and of the nerve endings of the cochlear nerve. This case differs from ours in that the nerve was macroscopically atrophic, and the vestibular branch was also affected; the connective tissue was rich in nuclei, the vessels were increased, and their walls were somewhat thickened.

Interstitial neuritis is especially familiar to ophthalmologists, and we have to thank them for an explanation of the much-debated question concerning the etiology and pathogenesis of this affection. The optic nerve in its retrobulbar part and the retinal ganglion cells are typically affected with interstitial neuritis following certain poisons (alcohol, tobacco, and *felix-mas*). Reasoning from this, some investigators have produced the same affection in animals. By

<sup>1</sup> *Verhandlungen der deutschen Otolog. Gesellschaft*, Heidelberg, Jan., 1900, p. 98.



examining the different stages of the optic neuritis produced in this way, the cause of the connective-tissue proliferation in the nerve was studied. Furthermore, the question of what causal and temporal relation the connective-tissue proliferation has to the destruction of the nerve fibres and ganglion cells was decided.

Nuel<sup>1</sup> experimented with *felix-mas* in dogs. In the first stage of poisoning the nerve was doubled in thickness, rigid and oedematous; the nerve fibres were destroyed rapidly, and disintegrated. There was no infiltration of leucocytes. After the fifth day increase of nuclei in the oedematous neuroglia appeared; the intercellular spaces became smaller, and their walls thicker; at the same time the neuroglia softened and disappeared. (Nuel's epithelioid cells, which are said to occur transitionally in this process, are according to Birch-Hirschfeld only cross-sections of swollen degenerated nerve-fibres.) The walls of the vessels are thickened (endarteritis) often obliterating the lumen. The retinal ganglion cells change in the first two weeks so that after this time the nuclei will not stain with the usual reagents. Nuel thinks in interstitial neuritis the first change is in the nerve fibre and not in the connective tissue.

Similar results are reached by Birch-Hirschfeld, Holden, and Rymowitsch through experiments with alcohol. The appearances of poisoning with *felix-mas* and alcohol are identical, and only show differences in grade, inasmuch as the alcohol neuritis progresses more mildly. These investigators agree that extensive changes of the ganglion cells in the retina may precede those of the nerve. Birch-Hirschfeld<sup>2</sup> found in experimental alcohol neuritis (in opposition to Uhthoff's clinical findings) that the connective-tissue septa were not rich in nuclei, and the vessels were numerous but had no thickening of the walls. Like Uhthoff and Siegrist, he maintains that essential differences exist between simple atrophy and interstitial neuritis. An independent partial retrobulbar affection of the nerve is the cause of the acute as well as the chronic alcoholic amblyopia, and this af-

<sup>1</sup> "Anatomie pathologique des nevrites optiques toxiques." *Rapport de la sect. d'ophtalmologie du XIII. congrès intern. de médecine*, Paris, 1900.

<sup>2</sup> *Gräfe's Archiv für Ophthalmologie*, vol. liii., p. 79, and vol. liv., p. 68.



fection is primary in the nerve fibres. The markedly thickened network of the endoneurium does not cause the disappearance of the nerve fibres by pressure. The atrophy of the latter occurs primarily, and the connective-tissue proliferation is a secondary change, which does not precede but follows the shrinkage of the fibre, and acts only as "packing."

The clinical and anatomical separation of interstitial optic neuritis from the gray degeneration of the nerve is principally due to Uhthoff,<sup>1</sup> who demonstrated that the connective-tissue fibres in the latter affection show another appearance, as even in more extensive proliferation the fine connective-tissue septa and consequently the structure of the nerve are preserved, and especially so, as there never is a complete obliteration of the network or disappearance of the nerve substance.

The analogy of retrobulbar alcoholic optic neuritis with the changes of the cochlear nerve in our case holds not only in the histological findings, but also in the location. For in our case the proliferation of connective tissue begins centrally from the ganglion, and is limited apparently to a short distance, but the process can be traced here and there in lessened degree back as far as the nerve is preserved in our preparation. We may therefore in this, as well as in Sporleder's case, speak of a retro-labyrinthine interstitial neuritis. Although we cannot follow the origin of this process in the acoustic nerve in the same way as has been done in the optic nerve, and we only know the final result—the sclerosis of the auditory nerve,—we may assume with considerable certainty that here the nerve fibres of the trunk together with the ganglia were first diseased. The atrophy of the peripheric part of the cochlear nerve in the lamina spiralis must be considered a secondary appearance depending on Waller's law.

After having described and explained the histological findings, we have to seek the final cause for the peculiar connective-tissue change in the nerve. Since local irritation of the acoustic nerve has not taken place, and both sides are affected,

<sup>1</sup> *Arch. f. Ophthalmologie*, vol. xxxii, p. 162.

our first thought is of an indirect morbid influence upon the acoustic nerves from some general disease or poisoning. These two factors are of great importance in the etiology of poliomyelitis and especially in peripheral-nerve disease, as numerous anatomical and clinical investigations of the last twenty years have shown. The infectious diseases, as well as the discrasias and cachectic conditions have gained in interest for us as otologists from the present conception of the doctrine of multiple neuritis. The importance of these two classes of diseases in reference to the etiology of the middle-ear disease has been long known. We are beginning to learn the special localization and also the manner in which the inner ear is affected through the blood supply in typhoid fever, diphtheria, mumps, measles, scarlet fever, small-pox, whooping-cough, pneumonia, erysipelas, sepsis, influenza, syphilis, tuberculosis, and malaria, and in addition in leucæmia, gout, rheumatism, diabetes, myxedema, marasmus, and cancer. We must go farther in this research before examining experimentally the local effects of the acoustic poisons, like salicyl, quinine, chenopodium oil, etc.

In our patient, from the anamnesis and general post-mortem conditions tuberculosis alone can be considered in explaining the development of the double interstitial neuritis of the cochlear nerve as it existed in our case. The centres of calcification in both apices indicate the onset of the disease at the time when she recovered from a long febrile attack in her fifteenth year, which was called "mucous fever." She did not know of any other illness. The patient dates back the beginning of her deafness at least twenty years, but it probably existed for a longer period.

We have an extensive literature on the anatomy and clinical appearances of diseases of the peripheral nerves which result from tuberculosis. Parenchymatous and interstitial changes with or without clinical appearances (latent neuritis) have been described by German and French investigators. These were, however, diseases of the nerves of the extremities, usually neuralgias and amyotrophic disturbances; also isolated cases of Landry's paralysis and paralyzes of the bladder and diaphragm, as well as peripheral

neurotabes, have been described. Affections of the cranial nerves in the phthisical have taken the form of paralysis of the vocal chords, nystagmus, and unequal pupils. Uhthoff,<sup>1</sup> moreover, among 221 cases of optic neuritis, found three cases which were traceable to phthisis. Involvement of the acoustic nerve in phthisis is not mentioned in the neurological monographs, not even in Remak<sup>2</sup>; recent reference books in otology contain nothing on this subject.

In our special literature there are several statements which allow the conclusion that neuritis of the acoustic nerve, of tuberculous origin, is not as rare as it might appear. The first notice I find in Frener,<sup>3</sup> who describes a man suffering from phthisis, who was troubled toward the end of his sickness "with deafness, nearsightedness, and tinnitus." Frener found that the auditory nerve was softer than usual and that its envelope was reddened.<sup>4</sup> The second note is by Erhard,<sup>5</sup> who, on page 359, mentions a nervous deafness which set in acutely in a phthisical patient after hemoptysis. This observer differentiates the diseases of the nervous apparatus from those of the outer and the middle ear, by the negative appearances of the drum membrane, and by his methodical investigation of bone-conduction, like our own of to-day. Further observations appeared in the appendix to his book<sup>6</sup> and under the title "*Surditas Nervosa Tuberculosa*," which I will cite on account of their importance and obscurity. He writes: "This seems to be a suitable place to cite a form of deafness which I have seen occur invariably with the same symptoms in the last stages of tuberculosis, and which in reference to prognosis can be considered a forerunner of death." Several case-histories with two post-mortem reports are given.

I. In 1857, I treated a lady who suffered from deafness, with excellent bone-conduction, due to thickening of the drum mem-

<sup>1</sup> *Rapport du XIII. congrès intern.*

<sup>2</sup> *Neuritis und Polyneuritis, specielle Pathol. und Ther.*, herausgegeben von Nothnagel, Band xi., Theil 3, Wien, 1900.

<sup>3</sup> *Über nervöse Taubheit*, Würzburg, 1823, p. 31.

<sup>4</sup> From K. J. Buck, *Die Krankheiten des Gehörorgans*, Heidelberg and Leipzig, 1827, pp. 125, 126.

<sup>5</sup> *Rationelle Otiatrik*, 1859.

<sup>6</sup> *Klinischen Otiatrik*, Berlin, 1863.

brane. She became tuberculous and feverish, and in a short time she became wholly deaf, with gradual decrease and disappearance of bone-conduction, without any special physiological phenomena, and without any anomalous secretion in the acoustic apparatus. Soon afterwards she died. II. In 1858, I treated a young lady also deaf from the same cause, with rare success, with my drum-cavity-vapor apparatus. Soon afterwards she had tuberculosis and died; complete deafness had set in with gradual loss of bone-conduction. III. In 1859, a young man consulted me for left-sided otorrhœa. The right ear was intact. His doctor wrote me in the fall that the right ear was beginning to fail without discharge, and that he was tuberculous. What should he do? I answered: "If the bone-conduction of the right side, which was formerly intact, decreases, there is nothing to be done. In my opinion crape is already on the door." Not long afterwards I received notice of his death. IV. In the winter of 1860, a young musical genius, a brother of my best friend, formerly perfectly well, contracted tuberculosis. At Christmas he first complained of decreasing hearing and diminished bone-conduction. At New Year he was dead. V.-VII. I was interested to find at the Charité if possible the pathological cause by post-mortems. In the winter semester, 1861-1862, through the kindness of Dr. Joseph Meyer, I observed three cases of tuberculosis with the same changes. Death followed in each case. I supposed at that time that the same connection existed between the retina of the auditory nerve and the marasmus of tuberculosis as exists between the retina of the optic nerve and Bright's disease, where a fatty degeneration gives a bad prognosis. So I asked a pathological expert to be careful of the acoustic nerve in the autopsy of the first subject, and we found in taking out the brain a noticeable yellow discoloration of the acoustic nerve in strong contrast with the facial nerve. In the autopsy of the second subject, the same appearances were found. In the microscopical examination of the nerve, no degeneration of the nerve fibres was found corresponding to the discoloration, so that we had to first investigate whether this yellow mottling is normal.

Farther on Erhard states that tinnitus was not noted in his cases.

Schwartz<sup>1</sup> mentions acute tuberculosis among febrile dis-

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<sup>1</sup> *Lehrbuch der chirurg. Krankheiten des Ohres*, 1885.

eases, causing hemorrhagic inflammation of the labyrinth. Whether the history reported by Schwartz<sup>1</sup> belongs to this group cannot be determined because it is too short. This refers to a phthisical patient, forty years old, who, twenty-two years before his death, became suddenly very deaf on both sides, in whom the bone-conduction was found absent at an examination ten weeks before his death. The changes found in the middle ear and labyrinth did not account for the deafness, since there was only a slight catarrhal swelling of the mucosa of the middle ear on one side, and the other ear was normal. Habermann's observation must be quoted with caution when he found extensive hemorrhages in phthisical patients between the nerve bundles of the terminations of the acoustic nerve (modiolus, maculæ, and cristæ).

The observations of Manasse, Sporleder, and myself are of importance in reference to the clinical and anatomical comprehension of our case, because the acoustic nerve of deaf phthisical patients showed distinct microscopic degenerative changes. Manasse<sup>2</sup> described the microscopical findings in both ears in a case of phthisis, who became deaf suddenly during the disease and died of lung trouble. The middle ear on both sides and part of the acoustic-nerve ending in the labyrinth, the cochlear ganglion, and the organ of Corti were unchanged (with the exception of striking staining reaction of the ganglion cells by Weigert's method). In the microscopical sections stained by Weigert's method, a great number of light spots were seen in the trunk of the acoustic nerve which was not shrunken. In these spots the nerve fibres were replaced by fine loose connective tissue with amyloid bodies. "The anatomical condition in these centres," Manasse says, "is the same as in multiple sclerosis and tabes. We must call all these changes, centres of multiple gray degeneration of the acoustic nerve."

I leave it undecided whether we have a simple degeneration, or, in opposition to Manasse,<sup>3</sup> an early stage of interstitial neuritis, such as was produced experimentally in the optic nerve by Nuel, Birch-Hirschfeld, and others, since both forms of nerve changes are observed in neuritis and

<sup>1</sup> *Arch. f. O.*, vol. i., p. 210.    <sup>2</sup> *Z. f. O.*, vol. xxxix., p. 1.    <sup>3</sup> *L. c.*, p. 6.



polyneuritis following infectious diseases. This statement holds good also in the case observed by Sporleder and myself.<sup>1</sup> It concerns a seventy-one-year-old inmate of our poorhouse at Bâle, called Rüedi, who for a long time had been a little deaf and then became tuberculous, together with Ménière's symptom-complex (loud tinnitus and dizziness); he became completely deaf and died quickly of pulmonary tuberculosis. There were no macroscopic changes. Microscopically, in the acoustic trunk there could be noted partly destroyed myeline sheaths to various extent, while chiefly in the basal whorl of the cochlea there was a quantitative change in the nerve elements. The rest of the labyrinth was perfectly normal. The atrophy of the trunk described by Sporleder does not really exist, as shown by my late researches, but is only the appearance caused by tearing off a part of the cochlear nerve in its whole length, even to the lamina foraminulenta, in cutting through the acoustic nerve at autopsy.

The cases which we were able to collect out of the literature on our subject have now been exhausted. I wish to report briefly a case treated by Dr. Bider, in Bâle, which I have seen twice in consultation. Since the post-mortem is lacking, its value is about the same as Erhard's cases, although its clinical course fits our subject perfectly.

A. W., twenty years old, always in good health, normal hearing, strongly built, temperate, was first taken sick March 1, 1893, with a diffuse febrile bronchitis. One week later, deafness commenced, with moderate tinnitus. I saw him on March 14th, and he was then completely deaf for speech. Tuning-fork  $a'$  was heard neither by air- nor bone-conduction. The drum membranes were unchanged. At that time I thought that it was a case of influenzal neuritis of the acoustic nerve. A month after the beginning of the general affection, the first infiltration in the apices was shown by percussion and auscultation. The ear remained almost unchanged. The drum membrane and inflation sounds were normal. Bone-conduction for fork  $a' = 0$ ; for fork A and  $a'$  by air  $= 0$ . The conversational voice (numbers) could be

<sup>1</sup> *Verhandlungen der otolog. Gesellschaft auf der 8. Versammlung, Jena, 1900, p. 101.*

heard close by, in 15-20cm. Soon afterwards deafness again increased and this time remained. The lung conditions grew worse, with almost continuously high evening temperature, and the patient became very thin. Then laryngeal tuberculosis appeared and on Aug. 3d—that is, five months after the beginning of the lung disease—death occurred. Meningitic symptoms, hemoptysis, and diarrhoea absent. The tinnitus did not disturb him much, and he did not complain of dizziness. Diagnosis: double neuritis of the cochlear nerve, resulting in deafness, consecutive to pulmonary tuberculosis.

At the first glance, it seems unusual not to find phthisis a cause of deafness in the statistics of the deaf and dumb, and also in the recent work of Bezold.<sup>1</sup> This is explained by the fact that tuberculous neuritis of the acoustic nerve is observed very rarely, and, moreover, we know that phthisis which results in deafness has a very malignant character and soon ends in death.

More than probable, at least a part of these cases, which are cited in deaf-and-dumb statistics, and are placed in the group of scrofulosis, in which granular affections, more rarely bone and skin lesions, occur, belong to the class of "deafness resulting from neuritis due to tuberculosis." These cases are about 1 % in the various statistics, a number which in the future will probably increase after attention is directed to it, and the etiological connection between tuberculosis and disease of the acoustic nerve has been positively demonstrated.

We must consider the functional results in our case and compare them with the findings of the microscopical examination of the auditory nerve. There were no symptoms of dizziness such as we observed in one patient, Rüdi, as the vestibular nerve was intact. Our observation agrees with the observations of Schwabach, Bezold, Moos, and Habermann, that in labyrinthine and acoustic-nerve affections both ends of the scale are contracted concentrically, as shown by air-conduction. It was interesting to me that in the left ear, where, besides the nerve affection, no other complication

<sup>1</sup> *Die Taubstummheit auf Grund ohrenärztlicher Beobachtungen*, Wiesbaden, 1902.

existed, both ends of the scale were equally affected, in contradistinction to my former observations on brain deafness, where the deeper sounds (in the commencement) were lost earlier than the higher ones. Since in the right ear, which was more deaf, the nerve was a great deal changed, we cannot draw any conclusion in regard to the functional importance of the filling found in the lower end of the tympanic scala of that ear. This is all the more to be regretted, because every change of the cochlea is associated with absence of a firm vibratory membranous foundation for Corti's organ in the lower end of the spiral plate, and there would have been a possibility of testing the validity of the theory of v. Helmholtz.

Reviewing briefly the results of our own and other investigations, we find the following results: Sometimes a polyneuritic degeneration of the acoustic nerve comes about in a hematogenous way, and appears simultaneously with extensive febrile tuberculous affections, which end perniciously. The cochlear nerve alone or the whole acoustic trunk may be affected. In these cases, we may find either a simple degeneration or an interstitial inflammatory affection; in both cases, however, the primary seat of the disease is located in the retro-labyrinthine section of the acoustic nerve, as far as we can assert from post-mortem results. Only in the rare cases, in which the patient survives the deafness for a long time, simple atrophic changes in the intralabyrinthine section of the acoustic nerve develop in addition to this primary retro-labyrinthine disease of the trunk. The clinical symptoms of the ear consist in decrease in hearing of both sides, which in rare cases comes on by degrees, but in most cases acutely, and then leads in a short time (days or weeks) to complete deafness. Often, but not always, there exist subjective noises, and when the vestibular nerve is affected, which is not frequent, the decrease in hearing is accompanied by violent vertigo.

#### EXPLANATION OF THE DIAGRAMS.

Fig. 1. Interstitial neuritis of the cochlear trunk in a late stage of the disease. (Van Gieson stain.)

Fig. 2. Cochlear and nerve under low power in vertical axial section. Thick and delicate hypertrophic connective-tissue bands in the cochlear nerve. The ganglia and nerve terminals in the cochlea diminished. (Van Gieson.)

Fig. 3. Vertical section through both labyrinth windows. Swollen infiltrated tympanic mucous membrane in the window-niche. Lower end of scala tympani filled with connective tissue. (Hematoxylin-eosin.)

Fig. 4. Vertical section through the lower fourth of the basal whorl of the right cochlea. The tympanic scala is filled with areolar connective-tissue containing bone. The vestibule scala is constricted on the inner wall by new-formed bone plates and Reissner's membrane is somewhat thickened. (Van Gieson.)

ON THE RADICAL OPERATION FOR CHRONIC  
EMPYEMA OF THE FRONTAL SINUS  
ACCORDING TO KILLIAN.

BY DR. ESCHWEILER, BONN.

Translated by Dr. ARNOLD KNAPP.

THE results published thus far show that Killian's method will probably replace all other operative procedures for the cure of chronic empyema of the frontal sinus. In addition to the papers of the author and his pupil Krauss,<sup>1</sup> favorable reports have been published by Hegner, Peterson, Luc, and Thiele. I can add eight further cases to those previously published in the literature.

They were all severe chronic suppurations in very large cavities, so that the favorable results can be referred not so much to the benign character of the case as to the excellent method of operation, which unquestionably deserves greater recognition.

The case-histories of my patients were as follows:

CASE 1.—Male, twenty-six years of age; admitted on July 5, 1902. Has suffered from discharge from the right side of the nose for many years, and occasional pain in the right half of the head. The symptoms have become aggravated during the past three weeks. The discharge and the nasal occlusion have been more pronounced. The pain regularly set in one hour after getting up in the morning, and persisted until four o'clock in the afternoon. During the night there was no pain.

The rhinoscopic examination revealed on the right side a large polyp, arising from the infundibulum, with pus appearing

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<sup>1</sup> Killian und Krauss, "Die Killiansche Radicaloperation," etc., *Arch. f. Laryngol.*, vol. xiii., pp. 23 and 58.



in its neighborhood. The anterior and lower walls of the right frontal sinus were tender on palpation. Transillumination was positive. After removal of the nasal polypi with a cold snare the frontal sinus was opened on July 15, 1902. The bone was rather thin, and was removed to such an extent as to admit easily a thick glass drainage tube. The probe revealed a large frontal sinus, which was filled with pus. The pus was carefully evacuated. As much of the mucous membrane as was visible appeared very much swollen and reddened, but not ulcerated. The nasofrontal duct was curetted with a sharp spoon and dilated with a Gruenwald forceps. A thick drainage tube was passed through the opening in the anterior wall of the frontal sinus, and the cutaneous wound was closed with sutures.

The after-treatment consisted in antiseptic irrigations through the drain into the nose. Pain ceased. Secretion diminished, but was not arrested. Recurring polypi had to be repeatedly removed from the right side of the nose.

At the end of August, the drainage tube had to be left out, as the canal became very narrow and the opening in the skin contracted.

The patient then remained away until September 26th, on which day, after a very severe bicycle trip, the scar became swollen and painful, and later opened, evacuating pus.

In the nose there was again purulent discharge between polypoid tissue. The radical operation was performed on November 27th.

The frontal sinus proved to be very large and presented an unusually deep orbital recess. Owing to the great depth of the orbital recess and the shallowness of the frontal sinus, it was impossible to remove the floor of the frontal sinus from above. The periosteum of the orbital roof was detached, together with the trochlea, in order to give access to the floor of the frontal sinus. The trochlea with its periosteum and the tendon of the oblique muscle were carefully separated. On detaching the periosteum, orbital fat appeared through a number of openings. The narcosis of the patient was very unpleasant, and interfered greatly with the accuracy of the operation. The anterior and lower walls of the frontal sinus were removed; the mucous membrane was curetted. A large opening was made into the nose, from which polypoid tissue was removed. A thick gauze drain was introduced from the inner angle of the bony cavity into the nose,

while a second narrower piece of packing was inserted in the temporal part of the wound. The wound was then sutured.

The subsequent course was afebrile. The gauze packing in the nose was removed after eight days. The opening in the temporal angle of the wound was kept from closing, as there was some discharge of pus. The wound subsequently closed, and the patient was discharged on October 25, 1902.

There had never been any symptoms of irritation on the part of the eye. Diplopia was not complained of. On examination, however, the patient admitted that on going downstairs the steps often appeared double. This diplopia persisted for only a few days.

In December a relapse took place. The middle of the scar bulged and on incision some pus escaped. As this fistula did not close, on January 6, 1903, the opening was enlarged and several small spicules of bone were removed from the depth. The wound then slowly closed and the patient was discharged healed in the beginning of February. He has since remained healthy. Re-examination in August of this year shows the site of operation normally healed. There are no polypi to be seen in the nose. There is slight discharge of mucus, which, however, gives him no trouble. The patient is able to pursue his vocation. He smokes and drinks beer with no bad effects. The cosmetic result is not quite satisfactory. The three-time incision has left a very distinct scar, and as these were all made above the eyebrow they are considerably more noticeable than usual. There is, however, very little deformity from the sinking of the skin of the forehead in consideration of the very large and deep cavity.

CASE 2.—Male, aged fifty-six; has suffered from discharge from the nose for many years, which would become more pronounced after taking cold, and would be associated with headache in the left frontal region. One of these attacks is at present going on. The pain is especially annoying in the morning; during the night it disturbs him very little. He complains of a very uncomfortable feeling in the head. A considerable quantity of thick purulent discharge empties into the left half of the nose.

The examination, on March 3, 1903, showed that the left side of the nose contained a great deal of yellowish purulent discharge. The anterior extremity of the middle turbinal is degenerated and thickened. About it pus fills the lumen of the middle meatus and appears to issue from the infundibulum. The right

half of the nose is normal. The left frontal-sinus region is tender, especially on palpating the lower wall at the inner and upper angle of the orbit. Transillumination is positive and shows on the left side an unusually extensive cavity.

The hypertrophied end of the middle turbinal is first removed. Two days later the frontal sinus is probed and irrigated. A large quantity of pus is evacuated without mucus and without fœtor. The irrigations are repeated every day with a cessation of the severe pain. The uncomfortable feeling in the head remains. The discharge of pus during the day did not diminish, and as after three weeks' treatment attacks of vertigo set in, the patient consented to the radical operation, which was performed on April 2, 1903.

*Operation.*—Morphine and ether narcosis. The left half of the nose was packed with gauze. A cutaneous incision was made along the eyebrow and carried down next to the nose. An opening in the anterior wall of the frontal sinus was made. The cavity contained a little pus and was clothed with a thick, œdematous, red mucous membrane. The cavity was very large and extended especially upwards, so that at the inner angle of the wound a vertical skin incision was made. After retraction of the skin periosteal flap, the entire anterior wall of the cavity was removed. The cavity extended very far temporally. After curetting the mucous membrane, the periosteum of the orbital roof was detached and the upper orbital wall was removed. This necessitated detachment of the trochlea. After removal of the roof of the orbit, the soft parts of the orbit did not extend into the frontal sinus.

The third step of the operation consisted in the resection of the frontal process of the superior maxilla, and in connecting this opening in the bone with the defect in the orbital roof as well as making a communication with the nasal cavities. The cells in the neighborhood of the naso-frontal duct, which were filled with œdematous mucous membrane, were carefully irrigated. So much of the nasal mucous membrane had to be removed that a flap could not be formed for plastic purposes. After removal of the nasal tampon, a glass drainage-tube was passed from the left half of the nose into the orbital part of the wound cavity. The external incision was closed with sutures.

In the subsequent course there was no rise of temperature. There was no severe pain. The sutures were removed on the

fourth day and the wound was found to be healed primarily. The drainage tube was removed the tenth day after the operation. There is practically no discharge from the nose. After removal of the mucus in the region of the anterior part of the middle meatus, the nasal part of the bone cavity can be observed through an oval fistula. Three weeks after the operation on the dorsum of the nose, a small point of pus appeared in the skin at the lower extremity of the cutaneous incision, which resembled an acne pustule. On incision, a drop of pus appeared. The probe detected no abnormality. The entire region was dressed with a moist boric-acid dressing. The small opening healed rapidly.

It seemed to me that the moist heat had a hastening influence on cicatrization in the depth, with depression of the skin of the forehead. Consequently this form of dressing was continued for two weeks.

The wound has since then been healed and all subjective symptoms disappeared. The eye was always free from irritation. There was no diplopia, though the patient was carefully examined in this regard. Cosmetically the result is very good as the scar can hardly be seen. Above the eyebrow there is a somewhat deep depression, which is distinctly to be seen, but does not deform the patient's face.

Re-examination in November, 1903, found the wound to have remained healed.

CASE 3.—Male, twenty-nine years of age; consulted me on March 25, 1903, declaring that he had suffered for one week from very severe headache, which was especially localized over the right eye. He had no complaint from his nose, though on further examination he reported that he had regularly discharged a small scab from the right side of his nose. On examination, the anterior and lower walls of the right frontal sinus were very tender. In the nose a greenish scab covers the extremity of the middle turbinal and the adjoining part of the septum. There was no pus in the infundibulum. Posterior rhinoscopy was negative.

It was impossible to pass a probe into the frontal sinus. Transillumination showed no difference between the two sides.

At first palliative treatment, with nasal irrigations and the administration of phenacetine, was tried. Later iodide of potassium was given. The symptoms persisted, and the patient, after treatment for three weeks, readily consented to a diagnostic opening of the right frontal sinus.

*Operation:* April 18, 1903. An incision was made as usual in line with the eyebrow, and the frontal sinus was opened at its anterior wall. The cavity was found filled with tenacious pus and very much swollen mucous membrane. As the patient had not been prepared for the radical operation, so much of the anterior wall of the frontal sinus was removed as would permit the insertion of a thick drainage tube. With the probe it was found that the nasal lachrymal duct was free. The pain disappeared after operation.

I had intended to treat the wound with irrigations, but the irrigating fluid did not run into the nose, notwithstanding the patency of the naso-frontal duct and although the patient was able to blow air into the frontal sinus with Valsalva's experiment. The drainage tube was therefore removed on May 4th, and the region of the frontal sinus was covered with a moist boric-acid dressing. The drainage opening healed in a few days.

Since the opening of the frontal sinus, from the outside, the discharge into the nose had increased without increase in the pain. The entire right side of the nose was filled daily with a thick greenish-gray crust which proved to be a cast of the entire interior of the nose. The radical operation was performed on May 22d. The cutaneous incision was like that made in Case 2. The frontal sinus was found filled with tenacious pus, and the mucous membrane was very much swollen. The interfrontal septum presented two dehiscences of about the size of the head of a pin, through which healthy bluish mucous membrane of the opposite sinus was observed. The periosteum of the roof of the orbit together with the trochlea was then detached, and the floor of the frontal sinus was opened into along the supraorbital margin. As the anterior wall of the frontal sinus was unusually thin and the chisel was not sharp enough, the inner extremity of the bridge of bone broke off. The floor of the frontal sinus was then completely removed. Thorough access to the nose was established by resecting the frontal process of the superior maxilla. No flap could be formed from the nasal mucous membrane. A thick drainage tube was inserted at the inner angle of the wound and the rest of the cutaneous incision was sutured. Healing took place by primary intention.

On the second day there was slight fever, and on the change of dressing the upper lid was found oedematous and red. Pressure in the region of the frontal sinus caused thick pus to escape at



this point. The sutures were removed and the entire cavity was dressed with a moist boric-acid dressing. The suppuration and œdema rapidly diminished.

On May 28th, the glass drainage-tube, which had been very uncomfortable to the patient, was removed. On June 4th, the wound was closed. On July 14th, rhinoscopic examination showed that the opening into the cavity had a tendency to close. It was enlarged. The production of scabs had increased, and the region of the right frontal sinus was again treated with moist dressings.

The peculiar character of the scabs led to a more exact examination. They were found to consist microscopically chiefly of mucus containing numerous epithelial cells and pus corpuscles. There was no fibrin. Bacteriologically, stained cover-glass specimens showed a large quantity of diplococci colored by Gram. Culturally, they belonged to the group of Friedlander's bacilli. There were no acid-fast bacilli.

*June 17th.*—A small polypus appears at the entrance to the wound cavity, which is removed with the snare. The entrance to the wound was treated every day with a 3-per-cent. solution of silver nitrate.

*August 17th.*—The patient after an absence of one week returns and complains of increased formation of scabs in the nose, and occasional headache which is not severe enough to prevent him from attending to his work. The skin of the flap is depressed, normally thin, and movable. In the nose, at the entrance to the frontal region, there are several scabs of the same character as previously noted. This region is treated every day with a 3-per-cent. solution of silver nitrate.

*September 1st.*—The patient still complains of headache. The left half of the nose is normal. The left frontal sinus is normal on transillumination. On September 12th, as the opening to the right frontal sinus appears somewhat narrow, the adjoining part of the middle turbinal is removed. This is followed by a severe bleeding which requires packing. Headache continued at rare intervals. There were occasional scabs found in the nose.

*December 15th.*—The cosmetic result is very good. The scar is not visible; the depression in the forehead is moderate.

CASE 4.—Male, aged thirty-seven years; has been under treatment for years on account of nasal polypi. He has complained considerably of headache, especially over the left eye. On

examination, July 18, 1903, the upper-posterior parts of the left nasal cavity are filled with polypoid masses and thick pus. The region of the frontal sinus is exquisitely tender. Transillumination is negative, both for the frontal as well as for the maxillary sinuses, while the conditions on the right side are normal. The first molar on the left side is carious. A number of polypi were removed from the nose. Irritation of the left frontal sinus did not exist.

Radical operation performed July 1, 1903. Morphine and ether narcosis according to Witzel. The incision is made exactly according to Killian's suggestion. The frontal sinus is filled with pus and œdematous granulation tissue. The trochlea is detached. The floor of the frontal sinus and the frontal process of the superior maxilla as well as the lachrymal bone and a part of the orbital plate of the ethmoid are removed to the extent of diseased cells. A glass drainage-tube is introduced into the nose. The external wound is closed with sutures. The antrum of Highmore is tapped after the extraction of the carious molar in order to irrigate subsequently. The wound healed primarily. The patient has suffered no pain and no rise of temperature. There was slight œdema of the lid. The eye was free from pain. The entire field of operation is covered with a moist dressing of boric acid.

*July 27th.*—The patient has suffered for the first time from pain. At the temporal end of the cutaneous incision in the eyebrow there is a fluctuating swelling. The œdema of the lid is more marked. An incision with a knife in the scar evacuates several drops of pus.

*July 31st.*—The swelling of the lid is less. The eye can be opened. On looking to the right and to the left, diplopia is complained of.

*August 2d.*—The wound is entirely healed. From the nose a broad access to the frontal sinus is visible without the presence of any discharge. Diplopia has ceased.

*August 5th.*—The patient is discharged. The skin of the forehead is somewhat depressed. Pus appears in the nose, coming from the antrum of Highmore. The subjective condition of the patient is very good. There is no headache; there is only slight discharge from the nose.

*August 19th.*—There is no pus coming from the cavity of the frontal sinus, but after carefully wiping the middle meatus, green

pus is seen coming from the maxillary opening. The opening in the alveolus is dilated and the maxillary antrum irrigated. A good deal of very foetid pus is evacuated. The patient complains of some ill-defined pain in the frontal region.

*September 1st.*—After repeated irrigations of Highmore's antrum there is only very little discharge. The patient is completely free from symptoms. Occasionally, on forced respiratory movements, the skin of the forehead becomes distended in the region of the operative wound. There evidently is a large communication. On looking directly downwards, disturbing double images appear. The patient is consequently forced in reading to hold the book somewhat higher than usual.

*October 1st.*—The patient irrigates his antrum every day. A considerable quantity of muco-pus without foetor is evacuated. There are no subjective symptoms. The diplopia on reading has passed away, though it still persists in writing.

*December 17th.*—There are no further subjective disturbances. There is slight discharge from the antrum of Highmore. The diplopia for writing has disappeared. The cosmetic result is good. The scar is almost invisible. The frontal depression is quite deep, though the margins are not marked, and does not deform the patient.

*CASE 5.*—Female, forty-one years of age; has been under treatment for a long time, on account of a chronic serous catarrh of the middle ear. The nose presents a spontaneous perforation of the septum, as large as a pea, and swollen turbinals. There is only moderate discharge from the nose. On July 7, 1903, the patient returns for treatment after an absence of a half-year. Suppuration now exists from the left ear. The *Mt* was very red and swollen. There was no perforation visible, though a moderate quantity of tenacious muco-pus was present. A pulsating pain is complained of in the ear. On the left side there is a muco-serous middle-ear catarrh associated with extreme subjective noises.

Admitted July 25, 1903. In addition to treatment of the ears, the nose was daily syringed with a solution of boric acid and with aristol insufflations. The hypertrophied extremities of the turbinals were removed. Daily examinations showed that considerable muco-pus was produced in the left nasal cavity. The region of the frontal sinus was almost insensible to pressure, though pressure at the inner and upper angle of the orbit finally

revealed some tenderness. Transillumination showed both maxillary antra transparent. Both frontal sinuses, however, were uniformly dark. Subsequently the symptoms became more pronounced, and pointed to an infection of the left frontal sinus, so that the radical operation was performed on August 5, 1903.

The frontal sinus was filled with pus and a glassy swollen mucous membrane; it was unusually small and did not extend far in a temporal direction. The frontal recess does not extend beyond 1 cm in height at the inner extremity of the eyebrow. Consequently the deformity remaining after the removal of the anterior and inferior walls was very small. Resection of the frontal process of the superior maxilla gave access to a very much diseased ethmoid labyrinth. The frontal and ethmoid cells were filled with pus granulations. The bony septa were softened and were removed with a sharp spoon. The inner wall of the orbit had to be removed quite deep. A broad communication was established into the nose and a glass drainage-tube as thick as a lead-pencil was inserted and fastened at the side of the nose. The cutaneous incision was sutured.

*August 11th.*—As the neighborhood of the wound showed inflammatory oedema, two sutures were removed and moist dressings applied.

*August 12th.*—The wound had healed. There was no pain, but diplopia was present.

*August 17th.*—There is some discharge from the nose. A broad opening is visible into the frontal sinus, and there is no pain. On prolonged use of the eyes, pain is experienced in the left frontal sinus. The eye itself is free from irritation. Diplopia is no longer present.

*August 21st.*—The patient has suffered for the last three days from headache. Rhinoscopic examination reveals nothing abnormal. The site of the operative wound is covered with a wet dressing.

*August 24th.*—The patient still complains of pain. Two small scabs are removed in the morning from the nose. The region of the inner angle of the eye is somewhat swollen.

*September 1st.*—After use of the eyes, asthenopic symptoms are complained of. Examination of the eyes revealed a certain amount of hypermetropia, for which glasses were prescribed. Though the wound appears healed, and only very little discharge is present from the nose, the patient still complains of pain and

of other symptoms, such as disturbance of menstruation, chronic constipation, associated with a neurasthenic condition.

*September 20th.*—The remaining part of the left middle turbinal was considerably swollen, and was removed. This was followed by some relief of the symptoms, and on November 9th the nose was almost free from pus.

*November 25th.*—No further symptoms from the forehead.

The cosmetic result is very good. At the dorsum of the nose the scar is slightly visible.

CASE 6.—Male, twenty-three years of age; has been an inmate of the hospital since February, 1903, on account of an inflammation of the lungs. In the course of this illness he suffered from very severe headache on the right side, and was operated on for this on March 19th. The wound in the forehead was kept open by packing until August. On the closure of the wound the severe symptoms returned, so that the patient consulted me October 10, 1903.

About 1.5cm above the right eyebrow there was a keloid scar, 3cm long, in the skin of the forehead, which was red, somewhat depressed, and tender. The roof of the orbit is only painful at the inner angle. There are severe subjective symptoms. The patient cannot bend over without suffering from severe pain in the right forehead, and is entirely unable to work. Rhinoscopically, the anterior extremity of the middle turbinal was found very much thickened, but no pus. The patient states that from time to time he was able to aspirate a collection of mucus from his nose. Transillumination shows a rather extended frontal sinus.

After admission to the hospital, on October 14, 1903, the anterior extremity of the right middle turbinal was removed, and on the 16th of that month the radical operation was performed.

After detaching the skin and the periosteum from the forehead, a cavity was encountered corresponding to the situation of the scar on the skin and containing thick creamy pus and granulations. The bony edges were removed and the walls curetted. The cavity extends very far up, though only slightly laterally. Downward and inwards it communicates by a moderately broad passage with a cavity, presumably an unusually developed frontal cell situated in the frontal process of the maxillary bone, containing thick granulation tissue. This space had evidently been overlooked at the previous operation.



As the frontal sinus did not extend far temporally, sufficient access was gained by resecting the portion of the frontal process of the superior maxilla and of the maxillary process of the frontal bone. The floor of the frontal sinus was partly formed by this latter process. Killian's bridge was preserved; the trochlea was not detached. The diseased frontal cells were then thoroughly curetted. A broad opening was made into the nose. It was impossible to form a flap from the nasal mucous membrane. A thick drainage tube was passed into the nasal part of the wound and the cutaneous incision was closed with sutures.

During the subsequent course there was no pain and no rise of temperature. The sutures were removed and the drain left off on the 20th of October. There was some retention of pus in the temporal angle of the wound, which healed after opening and dressing with moist boric acid.

On the 30th of October there was a small point of suppuration at the nasal extremity of the wound.

*November 4th.*—Considerable discharge from the nose. There are, however, no symptoms. On looking in all directions, diplopia is observed. The right eyeball is visibly lower than the left.

*November 20th.*—The slight œdema of the right upper lid persists. The patient has resumed work but is considerably annoyed by diplopia.

*November 27th.*—The eyes were examined and it was found that the disturbance of binocular vision did not depend upon interference of the function of the superior oblique muscle but upon an incongruent function of the muscles supplied by the third nerve. It is very probable that the inflammatory œdema has led to a slight dislocation of the entire right eyeball. Moist dressings are applied.

Two weeks later the double images have disappeared.

In the following two cases the plastic procedure according to Killian was successful. Case 8 is not entirely healed. It is, however, reported because it shows some very unusual features.

**CASE 7.**—Female, twenty-eight years of age, unmarried; has suffered for years from nasal polypi which have been freely removed. The long persisting headache has, however, not been influenced by the removal of the polypi, and she was led to consult me on November 8, 1903.

On examination, nasal polypi were found, together with some

pus in the region of the ethmoid. In the right side, a very large bulging ethmoidal bulla was found. Resulting from previous operations, the region of the middle turbinal presented a very unusual picture. The pain is localized to the root of the nose and the adjoining parts of the frontal and parietal regions and is present even at night. Tenderness on pressure in the frontal region is absent. Transillumination gave a clear picture.

On November 13th, polypi were removed and the ethmoidal bulla opened. No pus was found. As the pain persisted, the radical operation was performed, November 16th.

The left frontal sinus was absent. The bony funnel extending to the dura is enlarged in the direction of the internal angle of the eye. Here a small frontal cell is encountered, filled with hypertrophied mucous membrane. The region of the frontal process of the superior maxilla is exposed and the frontal and anterior ethmoid cells opened. They are all filled with diseased mucous membrane, but there is no pus. The opening in the internal orbital wall is enlarged so as to bring these cells into free communication. After all the diseased cells were curetted, I endeavored to enter into the nasal cavity, but found that this cavity was closed off by a rather thick mucous membrane belonging to the lateral wall of the nose. This wall was incised and the flaps turned outwards.

The entire cutaneous incision was sutured. The wound healed primarily; no rise of temperature; no severe pain.

*November 24th.*—Moist dressings have been applied. The conditions rhinoscopically are very satisfactory. In the space between the septum and the lateral wall of the nose, in front of the middle turbinal, a large opening is seen leading into the region of the cavity made at operation. There is a slight amount of discharge but no pain.

*November 26th.*—The patient is entirely free from pain and is very happy. The region of the inner angle of the eye is still somewhat swollen. The scar is hardly visible and not tender.

*December 11th.*—The patient is discharged, healed.

CASE 8.—Male, forty-four years of age; consulted me September 14, 1903, stating that after an attack of influenza in July he suffered from a very severe cold in his head. Three weeks ago very severe pain was felt in the forehead, and a specialist, whom he then consulted, removed parts of the middle turbinal on both sides. On transillumination, the left frontal sinus remains dark;

the right, as well as the two maxillary antra, is translucent. The subjective signs are unusually severe, though the patient has relief during the night. Directly upon getting up, the pain begins and continues until the afternoon, though even after this time he is absolutely unable to perform any mental work and cannot even read a newspaper.

On examining the nose, a considerable quantity of creamy pus can be seen in front of the remnants of the middle turbinal. On attempting to pass a probe, a frontal cell was encountered and the frontal sinus could not be probed. Treatment consisted in daily irrigations of the nose and the use of Hartmann's air douche. The conditions improved under this treatment. The headache was somewhat less and not so severe and ultimately disappeared almost completely. The secretion became mucoid. On October 10th, transillumination showed that the left frontal sinus was just as bright as the right one.

On October 12th, the patient was allowed to go home with instructions to syringe out his nose daily and insufflate aristol. As long as the patient remained at home the condition was satisfactory. On returning to work, however, the symptoms gradually returned and on November 16th he again presented himself.

The rhinoscopic picture had not changed. There was some grayish muco-pus emanating from the opening of the naso-frontal duct. The region of the right middle turbinal was covered with purulent discharge. Most of the discharge passes into the throat and considerable muco-pus was found in the pharynx. On palpation, both frontal sinuses were uniformly and slightly tender. Transillumination showed both frontal sinuses to be unusually large and uniformly translucent.

Under these circumstances, I advised the patient, who had lost weight, to undergo a careful physical examination. As this examination proved negative, I decided to open the frontal sinuses for purposes of diagnosis.

This operation was performed on November 21, 1903. Incision along the left eyebrow. The hemorrhage was unusually free. After chiselling through the thin anterior wall of the frontal sinus, this cavity was found to be filled with muco-pus and thick oedematous granulation tissue. The cavity was very large and extended upwards and especially backwards. The distance from the margin in the opening of the bone to the base of the orbital process was 6cm. The radical operation was then performed and

a large flap was formed from the nasal mucous membrane. The removal of the base of the frontal sinus proved to be very difficult on account of the depth of the orbital recess. It succeeded, however, with preservation of the trochlea. On curetting the mucous membrane at the interfrontal septum through a large dehiscence, access was gained into the right frontal sinus. Before completing the toilet of the left frontal sinus, a small opening was made into the anterior wall of the right frontal sinus, and this cavity was found to be healthy. The cutaneous incision was sutured and a glass drainage-tube was inserted into the nose. Subsequently, there was at first moderate pain but no fever. The sutures and drainage tube were removed on November 24th.

On November 26th, the wound is healed. The œdema in the neighborhood is less. Rhinoscopically, a similar condition to that in Case 7 is found.

*December 1st.*—The discharge into the nose and pharynx has diminished. The frontal region is dressed with a moist boric-acid dressing.

*December 9th.*—The discharge has almost completely ceased. The patient complains of general malaise, occasional pressure in the head, but without frontal pain.

*December 15th.*—The patient is allowed to go home. The skin of the forehead has not sunk in. The upper eyelid is slightly œdematous. Local symptoms do not exist. In the right nose the mucous membrane has lost its swollen condition and the discharge has ceased. In the left nasal cavity there is moderate mucous discharge.

The patient is to return in four weeks.

It cannot be denied that the performance of Killian's operation requires considerable technical skill on the part of the operator. Every one will make the experience that his operating improves with the number of operations performed. The removal of the floor of the frontal sinus is sometimes very arduous, as Killian remarks, especially in the case of a frontal sinus which is not extensive in a vertical direction but very deep fronto-occipitally. This was especially pronounced in Cases 1 and 8. In these circumstances, this part of the operation is very much simplified if the detachment of the periosteum of the orbital roof is not interrupted at the trochlea, but this latter structure is removed, together with the orbital tissues, so that the roof of

the orbit corresponds to the floor of the frontal sinus. If we are careful to preserve the connection of the tendon of the oblique muscle with the periosteum, and then detach the trochlea *in toto*, the danger of permanent functional disturbance is very slight. The detached portion becomes united to the supraorbital bridge. In the first five cases, the trochlea was detached. In these, the diplopia was usually not present, or only transient, though the patients were repeatedly examined in this regard. In Case 4, however, an obscuration of distinct vision with moderate diplopia persisted for a long time after the operation, on looking downward. Though the patient was not disturbed in his vocation, nevertheless this is a warning, and I should advise the detachment of the trochlea only for those cases where the removal of the floor of the frontal sinus cannot be carried out from above.

Owing to the slight probability of the occurrence of diplopia, the radical removal of the floor of the frontal sinus appears to me to be more important than the preservation of the trochlea. If the latter is detached, it may be feasible to fix the region of the pulley to the tissues above with a deep suture. It is not surprising that diplopia occurs during the first days, and this is probably caused by transient disturbance in the function of the oblique muscle. The changes in the position of the orbital tissues, which are the result of the removal of the orbital roof and of a certain retraction on the part of the orbital tissues to the operation, can cause a temporary disturbance in binocular vision, as is shown by the fact that certain patients of Killian have also suffered from transient diplopia. In our patient, Case 6, where the trochlea was not detached, diplopia was present in all directions four weeks after the operation. This was most pronounced when the œdema of the upper eyelid was marked. The diplopia disappeared together with the swelling of the upper lid. As the ocular examination revealed a normal condition of the superior oblique muscle, the diplopia must be referred to a dislocation of the eyeball, produced by the inflammatory swelling in its neighborhood. Generally speaking, the reaction of the operation and healing of



the wound on the orbital contents is not pronounced. In not a single case was there any iritic irritation, even though before the operation no atropine had been given. It is, however, very important that the eyeball should be spared all pressure and it should not be used as a support for numerous artery clamps. I have, therefore, always immediately ligated all blood-vessels.

If the anterior wall of the frontal sinus is very thin, the formation of the bridge must be made with extremely sharp chisels, otherwise it is possible to produce a fracture of the bridge, as occurred in Case 3. This has, fortunately, just as in Killian's case No. 6, not led to any deformity. It is, however, an undesirable incident.

Certain technical difficulties are also met with in making a broad communication into the nose. After resecting the frontal process of the superior maxilla, which can be well done by cutting-forceps, the adherent spicules of bone must not be torn away for fear of injuring the lachrymal sac. The frontal and other ethmoid cells are easily exposed. These were found diseased in all eight cases. The eradication of the posterior ethmoid cells, which were found diseased in Cases 4 and 6, was not difficult. After making an opening into the nose, a very annoying bleeding occurs into the upper respiratory passages, which can often not be controlled by packing of the nose. As the patient in this stage of the operation is still deeply anæsthetized, unpleasant disturbances of respiration may set in, especially as the manipulations in the interior of the nose act reflexly upon the respiration. This is especially marked if we resect the anterior part of the middle turbinal. As it is well known that it is much easier to operate in the nose on patients who are not anæsthetized, I think it is much safer to clean out the nose thoroughly and remove the polypi and hypertrophies of the anterior extremity of the middle turbinal several days before performing the Killian operation. In the cases in which I have followed this plan, I have always been satisfied with the condition of the nose in the after-treatment. In the other cases, further operations in the nose were required.

The formation of flaps from the mucous membrane from the lateral wall of the nose, as has been described by Killian, was first successful in Case 7. This is probably due, as the experience of Thiele and others shows, to an insufficiently developed technique. In Cases 4 and 5, however, it would have been impossible for the most experienced hand to obtain material for a plastic step. In Case 4, the entire mucous membrane of the nose was in a state of high-grade polypoid degeneration, so that the ethmoid was in no place covered with normal mucous membrane. In Case 5, the ethmoid was so softened and perforated with pus that curetting led immediately into the nose. For healing, this plastic procedure is probably not absolutely essential. It is, however, unquestionably of considerable value, as it prevents a premature narrowing of the broad communication into the nose. The tendency for openings in the nose to close which have not been treated with a plastic step is well known.

During the first part of the after-treatment, the discharge would freely pass into the nose. I do not agree with Kuemmel that after removal of the floor of the frontal sinus the lateral parts of the frontal sinus are easily shut off by cicatrices if the cavity is a large one, because it is just the lateral and the deep occipital parts of the large cavities which are filled in with the orbital soft tissues. The nasal part of the cavity remains a funnel which does not obliterate, but is only in part filled with granulation tissue and in part lined with nasal mucous membrane. This part of the wound must naturally remain in broadest communication with the nose and must not become the seat of a retention of discharge. The swelling of the soft parts after resection of the floor of the frontal sinus is more pronounced in young individuals than in old, and more pronounced in people with prominent eyeballs than in those with deep-set ones.

In Case 1, the periosteum of the orbit was adherent in one place and considerable of the orbital fat protruded, which interfered somewhat with working at a depth. It is especially important that the floor of the frontal sinus be regularly removed up to the point of junction with the upper wall so

that no bony recess may remain. As the first case was operated on before Killian's publication appeared, I had the same experience with suture of the wound as the author of the method. I feared at first to suture the wound primarily and introduced iodoform gauze. In the subsequent cases, the wounds were all sutured with the best results. In not a single case was there a stitch-hole abscess, and I think this was probably due to the use of wire as a suture material. Killian recommends celluloid thread because stitch-hole abscesses are very frequent in the use of silk. These suppurations are especially undesirable as the cosmetic result is disturbed by them. The very thin silver wire which Witzel now almost exclusively uses I have found excellent for this purpose, because it can be sterilized by boiling and offers the greatest protection against imbibition.

A disturbance of primary union, excepting in Case 1, occurred only in Case 3. A mistake in the sepsis was probably not present. I should be more inclined to regard as responsible the acuteness of the suppuration and consequently the pyogenic organisms. The case-history shows that the patient had suffered from the formation of scabs in his nose for years, but the severe pain had lasted only one week. It was unquestionably a case of acute exacerbation of chronic suppuration and the primary suture failed just as in Case 14 of Killian. Killian recommends, in connection with this experience, to suture only secondarily in such cases. The question naturally arises, Where does the acute stop and the chronic case begin. In Case 6, where such severe subjective symptoms and such severe pressure pain were present, an acute exacerbation surely seemed to be the correct diagnosis. Notwithstanding, recovery with primary suture was smooth.

In regard to the pyogenic organisms in Case 3, the condition found was an unusual one. In empyemas of the accessory cavities, creamy or muco-pus is present, and the crusts are only formed when the discharge is slight. In this case, from the beginning scabs were formed resembling in color and consistency those occurring in ozæna, but they were not foetid. In water they broke up in grayish-white thick pieces.

Microscopically, diplococci were found to be the pyogenic organisms.

The slight disturbances occurring in the healing in Cases 2, 4, and 6 can not be regarded as disturbances of healing by primary intention. In Case 2, two weeks after the operation, a small pustule appeared in the lower part of the cutaneous incision.

In Case 6, catgut ligatures were cast off from a number of similar pustules. In Case 4, seven days after the operation, a small quantity of pus was evacuated, and in Case 6, on the fifth day, a certain amount of chocolate-colored fluid had collected under the skin and was evacuated after an incision. In both of these cases the condition was probably one of hæmatoma.

The great service which the wet dressings with boric acid served led me to continue their use in the later cases even without disturbance of the wound-healing, thinking that the moist heat exerted a beneficent influence upon reparation in the deeper layers.

I used glass drainage-tubes as large as lead-pencils with lateral openings. These were introduced into the nasal angle of the wound cavity. The removal took place in Case 2 on the tenth day, in the other cases on the fourth or fifth day. The sutures were always removed on the fourth day.

No pain was complained of after the operation. The subjective condition of the patient as well as the favorable course of the wound-healing made a longer stay than fourteen days in the hospital unnecessary.

Healing is a relative conception in these cases. Even after the use of Killian's method, in the presence of the complicated structure of the accessory cavities of the nose healing in the anatomical sense may not always be possible. We must speak of a healing in the clinical sense when (1) the cutaneous incision is closed; (2) the frontal-sinus region is no longer tender on pressure; (3) no marked diplopia; (4) the patient is able to work.

Case 4 presented some unusual features. It was noticed during the after-treatment that the skin of the forehead over the frontal depression sometimes exhibited respiratory



movements. The tissue at the nasal entrance to the operative wound remained thickened and œdematous. This was easily explained by the continuing suppuration from the maxillary antrum. The respiratory movements of the frontal sinus are very remarkable and can be explained only by the formation of a duct in place of the bony frontal sinus. This duct had probably become lined with a pyogenic membrane and discharged pus, especially when a cold in the head or an injury exerted an unusual irritation. Owing to the distensibility of the anterior wall and the presence of retention, this suppuration produced no symptoms and will probably not require another operation.

Case 5 was a woman. Notwithstanding a satisfactory condition of the scar and the interior of the nose, the subjective symptoms persisted. It is to be remembered that this unmarried woman of forty-six years was already suffering from climacteric disturbances, from tinnitus, and other nervous symptoms. At the same time, it cannot be assumed that all these complaints were without reason, as the removal of the rest of the middle turbinal caused an amelioration in most of the symptoms.

The necessity of a further operation was present in Cases 3 and 5. In Case 3, the frontal sinus was completely obliterated. The normal skin of the forehead covered a painless depression over the right eyebrow. There was no swelling or redness. The patient is a policeman and is able to do his work in all kinds of weather, though the scab formation in his nose continues and occasionally gives rise to severe headache in the right frontal sinus.

In Case 3, the possibility exists that the left frontal sinus became subsequently infected through dehiscences in the interfrontal septum. This, however, is not in accord with the normal condition of the skin of the forehead over the depression and the absence of pain in the region of the left frontal sinus.

In Case 8, notwithstanding the perforation of the septum, no infection occurred.

The cosmetic results are, with the exception of the atypical Case 1, excellent. The scar caused a deformity in no case



and often could be seen only with difficulty. It seems hard to understand how Lermoyez objects to Killian's method on account of keloid scars. This author has presumably seen only cases which were operated on before Killian had perfected his method. Though the scar does not cause any deformity, the presence of a depression over the affected frontal region is to a certain extent unpleasant. In large frontal sinuses this depression is very noticeable. But in order to judge of a cosmetic result it is not right to compare a person operated on according to Killian with a normal person, but rather with some one operated on by another method. My personal experience comprises patients operated upon by removal of the anterior wall, by removal of the anterior and inferior walls, and those where an incision was made in or above the eyebrow, and the frontal sinus was simply opened in the anterior wall and after-treatment was carried on by packing and irrigation. The latter method, which can probably be regarded as obsolete, makes a great deformity, especially if the incision is above the eyebrow. A keloid-like scar forms after the wound has been kept open for a long time, especially if the skin has been retracted after a suppuration of the frontal sinus.

It need not be mentioned that the removal of the anterior and lower walls without the preservation of a bridge produces a very decided deformity.

As regards the prevention of a deformity, Kuhnt's method most nearly resembles Killian's, except that in Killian's operation the orbital soft parts fill out the operative cavity, and this gives the method an advantage in a cosmetic sense. The resulting depression is not striking. In Case 5, it was not at all noticeable. In Case 4, notwithstanding the extension of the frontal sinus upwards, the depression is relatively shallow, which is due to the careful removal of the edges of the wound and the relative moderate depth of the cavity. In Case 6, which had been operated on elsewhere with considerable deformity, the cosmetic result was improved by the second operation, as the old scar in the forehead is no longer drawn into a defect in the frontal sinus, but lies in a flat depression. In Cases 2 and 3, where unusually large

frontal sinuses were present, deep depressions exist. Notwithstanding this, the cosmetic result, compared to other methods, is an excellent one. The correction of this deformity by the injection of paraffin can be considered if necessary.

My experiments with Killian's operation have been so satisfactory that I consider it to be therapeutically and cosmetically the best treatment for chronic empyema of the frontal sinus, and shall henceforth perform no other.

In conclusion, I should like to add a few words on the diagnostic value of transillumination of the frontal sinus. I have been an adherent of diaphanoscopy for a long time. Not that a negative result has always been an indication for therapeutic procedure, but in cases where the two frontal sinuses were equally translucent I have decided upon an absence of pus and granulation tissue. This view has had to be changed on account of the experience in Case 8.

The opponents of transillumination have admitted that an obscuration of one frontal sinus in the beginning of treatment and the return of its translucence can be of diagnostic value. In Case 8, this has not proved true. As can be seen from the case-history, in the beginning of treatment the left frontal sinus was dark, then became translucent, and on the return of the patient was absolutely bright. The two translucent areas were absolutely congruent and corresponded to the dimensions of a normal frontal-sinus, and were sharply distinct, and it seems to be unquestionable that the frontal sinuses were translucent. The operation on the two sinuses, two days later, showed that both large frontal sinuses were of the same size and had very thin anterior walls. The right one was normal, and the left one was filled with muco-pus and a thick layer of granulation tissue. The translucency of a frontal sinus, therefore, does not prove the absence of an empyema.

If, however, a severely diseased frontal sinus, as in our case, remains translucent, just as the healthy one on the other side, it shows that diaphanoscopy can no longer be regarded as an aid for diagnosis.

## ON THE OPERATIVE TREATMENT OF OTITIC INTRACRANIAL COMPLICATIONS.

BY PROFESSOR DENKER, OF ERLANGEN.<sup>1</sup>

(With Plate I., *Zeitschr. f. Ohrenheilk.*, Vol. XLIII.)

Abridged Translation by Dr. C. H. R. JORDAN, New York.

THESE six cases of intracranial complications followed acute and chronic purulent otitis and were all operated upon; they illustrate the path along which infection from the middle ear may extend.

It is well known that bacteria and toxins may pass to the endocranium by way of all of the tympanic walls, with the exception of the outer wall, and by way of the bony surfaces of the mastoid process, which border on the middle and posterior cranial fossæ. The infection may travel along bony and vascular channels, as well as through defects in the bone, which are not infrequent in the roof and in the floor of the tympanum. The process may further lead to destruction of a window-membrane or a part of the labyrinth wall, and gain access to the posterior cranial fossa through the labyrinth, or it may directly reach the interior of the skull after carious disintegration, or necrosis of an area of a bone directly adjoining the brain.

In addition to the more frequent otitic complications, we find rarely serous meningitis, a condition which has not as yet been demonstrated at autopsy, œdema of the brain, and cerebral embolus in otitic thrombosis of the carotid artery.

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<sup>1</sup> Read before the Medical Society in Hagen i. W., with presentation of cases and specimens.

**Case 1.—Mastoiditis and perisinuous abscess in acute otitis media.**

F. W., fifty years old, had been suffering from an acute inflammation in his right ear for ten days when he presented himself for treatment on April 16, 1901. The middle ear was discharging freely through a small perforation in the upper posterior quadrant which was bulging. Moderate tenderness over the antrum and along the posterior border of the mastoid. There was no pain and no general disturbance whatever. Pulse and temperature were normal. In spite of daily treatment and application of ice, the mastoid tenderness became more marked and the posterior meatal wall began to sag.

*April 24th, Operation.*—Soft parts slightly infiltrated; whole mastoid filled with pus; cell-structure largely destroyed. Pus is seen to ooze from a fistulous defect in the sigmoid sulcus; its enlargement leads to a perisinuous abscess containing over a teaspoonful of pus. The sinus wall seems somewhat congested but otherwise normal. The subsequent course was uneventful. The function was completely restored and the wound closed in ten weeks.

*Remarks.*—The perisinuous abscess, if not evacuated in time, might have caused sinusphlebitis and general pyæmia. There were no symptoms pointing to the presence of an extradural abscess—save, perhaps, tenderness along the posterior border of the mastoid. Considering the frequency of extradural abscesses in the posterior fossa, it would seem advisable to lay bare the sinus in all cases where the suppurative process has reached the bony sulcus.

**Case 2.—Extradural abscess in middle cerebral fossa and fistula in external semicircular canal in chronic otitis media.**

F. F., ten years of age, has chronic suppuration of the right middle ear, following scarlatina. No general symptoms; no pain; no vertigo. Tympanum filled with granulation tissue; total defect of membrane; no trace of ossicles. The fœtor persists in spite of long-continued treatment.

*Radical Operation, Sept. 22, 1900.*—Bone sclerosed. Antrum enlarged; filled with cholesteatoma. A carious defect in the tegmen leads to an extradural abscess containing 8 to 10ccm of very offensive pus. The dura is exposed as far as covered with granulation tissue and the latter scraped off. Another carious defect is

found on the external semicircular canal; whenever the exposed membranous canal is touched with a probe the head is invariably turned in the opposite direction. Koerner meatoplasty. Wound epidermized within ten weeks.

*Remarks.*—There were no symptoms to indicate the presence of an extradural abscess, or of a labyrinth fistula; evidently the exposed labyrinth had not yet been infected.

**Case 3.—Temporo-sphenoidal abscess in chronic otitis media sinistra. Operation. Recovery.**

Same patient as Case 2. Left ear.

*Status Præsens.*—May 28, 1900. Discharge very profuse and offensive; canal obstructed by polypi. Mastoid very tender on pressure. Headache, vomiting, dizziness. Temperature, A.M., 101°. Pulse 70. Percussion of squama very painful. No optic neuritis; no cerebral symptoms.

*Radical Operation.*—Cholesteatoma in antrum; polypoid granulations in aditus and tympanum. No ossicles found. Carious defect in tegmen antri; dura is laid bare as far as covered with granulations (2 x  $\frac{3}{4}$  cm). The latter are scraped off, and an exploratory needle is thrust into the temporal lobe from below upward. The second puncture strikes the abscess. The dura is then incised, a forceps introduced, and a tablespoonful of offensive pus evacuated. With the finger a distinct abscess membrane can be felt. Cavity is packed with iodoform gauze. From the second day, temperature and pulse remained normal, and recovery was rapid and uninterrupted. Cerebral wound healed June 23d. Epidermization of middle ear complete in eighteen weeks.

*Remarks.*—The clinical symptoms—mental dulness, headache, nausea, dizziness, slow pulse—were those of increased intracranial pressure, and suggested the presence of an extradural or cerebral abscess. Localizing symptoms, however, as aphasia and hemiplegia, were absent.

**Case 4.—Temporo-sphenoidal abscess, extradural abscess, and subperiosteal abscess. Recovery.<sup>1</sup>**

E. T., seven years old, was brought to me October 8, 1900, with chronic suppuration of the right middle ear and grave intracranial symptoms.

<sup>1</sup> Reported extensively in the *Deutsche medicinische Wochenschrift*, 1901, No. 2.



*Status Præsens.*—Defect of drum membrane; tympanum filled with macerated epidermis; mastoid tender; temporal region infiltrated, very sensitive. Swelling of retromaxillary glands. Temperature, A.M., 99°. Pulse 72, somewhat irregular and tense. Vomiting. Marked apathy. Severe headache. Gait staggering. Pupils equal, react promptly.

*Oct. 9th.*—Somewhat better under application of ice. Temperature 98.8°. Pulse 71. P.M.; Temp. 97.2°; pulse 70.

*Oct. 10th.*—Rapid change for the worse. Vomiting. Right pupil becomes dilated and without reaction within a few hours; distinct optic neuritis. Left eye normal. Urine voided involuntarily. Coma. Temperature 96.8°. Pulse 60.

*Radical Operation.*—Antrum, aditus, and tympanum filled with offensive pus and cholesteatoma. No communications between middle ear and endocranium. The incision is extended upward and foetid pus found underneath the periosteum. The middle fossa is entered by making an opening (the size of a quarter) into the squama; the tegmen tympani is also removed. A teaspoonful of extradural pus is evacuated. The dura, covered with discolored granulation tissue, bulges into the opening. After a successful puncture, the dura is incised and cerebral abscess evacuated. It had the size of a hen's egg, and contained 70–80ccm of foetid, sanguinolent pus. A distinct membrane could be felt. After the evacuation, the dilatation of the right pupil disappeared; the pulse rate went up to 86. No more vomiting. Undisturbed recovery followed. The abscess cavity healed within eight weeks; middle ear epidermized (with permanent retroauricular opening) in five months.

*Remarks.*—The general cerebral symptoms observed were: severe headache, slow pulse, staggering gait, and mental apathy. The optic neuritis was confined to the eye of the affected side, the fundus of the opposite eye showing no pathological changes whatever. The occurrence of one-sided optic neuritis in cerebral abscess had been denied by Macewen and Körner. Statistics of the Halle Clinic, however, recently published by Hansen, show that optic neuritis in cerebral abscess was bilateral in 87.5 % of the cases, while the eye of the affected side alone was involved in 12.5 %. The only focal symptom was the partial paresis of the oculomotor nerve. It was observed that at the moment of

the evacuation of the abscess the mydriasis disappeared, and the pulse rate rose. The temperature was largely subnormal before and for several weeks after the operation.

**Case 5.—Multiple cerebellar abscesses ; basilar meningitis. Death.**

H. T. has been suffering from acute otitis media after influenza, since Oct. 2, 1901.

*Oct. 22d.*—Profuse discharge, bulging of Shrapnell's membrane, small perforation above short process ; moderate tenderness over antrum.

*Oct. 26th.*—Great apathy, vomiting, subnormal temperature, pulse 80. Pupils somewhat sluggish.

*Nov. 2d.*—Temperature  $96.2^{\circ}$ – $97.8^{\circ}$ . Pulse 60–70. Respirations 11 to 14. Headache. Mental dulness. Retention of urine. Pupils equal but sluggish. Fundi normal. No paretic symptoms.

*Operation, 6 P.M.*—Mastoid cells filled with granulation tissue, bone very soft. In order to explore the tegmen tympani, a radical operation is done. The whole tegmen is removed and the adjoining bone back to the sinus. The exploring needle is thrust into the temporal lobe five times without result. The cerebellar dura is then exposed behind the sigmoid sinus ; it shows no pulsation. The third puncture strikes the abscess, which is drained in the usual way. It contained 7 to 8ccm non-odorous creamy pus ; no limiting membrane could be felt.

*Nov. 3d.*—No more vomiting, no headache.

*Nov. 4th.*—Temperature  $97^{\circ}$ – $98.4^{\circ}$ . Pulse 80–72. Patient feels well.

*Nov. 5th.*—Temperature  $96.8^{\circ}$ – $97.5^{\circ}$ . Pulse 68–60. Vomiting. Dressing changed under narcosis. Little discharge from cerebellum.

*Nov. 6th.*—Temperature  $96.4^{\circ}$ – $97.4^{\circ}$ . Pulse 70–80.

*Nov. 7th.*—Vomiting.

*Nov. 8th.*—Prolapsus cerebelli.

*Nov. 9th.*—Beginning optic neuritis in left eye ; deviation of the eye toward the right. Vomiting. Temperature down to  $95.9^{\circ}$ .

*Nov. 11th.*—Good appetite; no vomiting. Marked bilateral optic neuritis.

*Nov. 12th.*—General condition and appetite good. Pulse 76–89. Temperature  $97.4^{\circ}$ .

*Nov. 13th.*—Vomiting.

*Nov. 14th.*—Mobility of eyes better. Vision of left eye diminished. Patient recognizes a watch but cannot make out the time. Paresis of left arm and leg. Appetite good.

*Nov. 18th.*—Optic neuritis increased in left eye; distinct "choked disc."

*Nov. 23d.*—Repeated vomiting; some headache. Vision, R  $\frac{1}{2}$  L  $\frac{1}{2}$ .

*Nov. 28th.*—Vision, L  $\frac{1}{2}$ .

*Nov. 29th.*—Vomited all night. Pulse 60. Temperature 96.2°. 10 A.M., removal of prolapse (size of walnut.) Incision into cerebellum opens a new abscess containing  $1\frac{1}{2}$  tablespoonfuls of pus. Cavity drained with iodoform gauze. Pulse 80–90. Left eyesight better.

*Dec. 2d.*—Vomiting. With left eye patient cannot see the time.

*Dec. 3d.*—Headache. Pulse 62. Retention of pus; relieved by probing.

*Dec. 4th.*—Pulse 78–116. Temperature 97.0°–97.8°.

*Dec. 5th.*—Headache. Temperature to 103.0°. Pulse to 130.

*Dec. 6th.*—Meningeal symptoms.

*Dec. 10th.*—Coma; left eyelids swollen.

*Dec. 11th.*—Death.

*Autopsy.*—Transverse and sigmoid sinus free. Besides the abscess operated upon, two more abscesses (one small and one large) were found in the left cerebellar hemisphere. Purulent basilar meningitis. The larger one of the two above mentioned abscesses had broken into the arachnoidal space. Phlebitis of cavernous sinus.

*Remarks.*—The most remarkable feature of the case is the rapidity with which the inflammation of the middle ear was followed by an intracranial complication. The ear had begun to suppurate on October 2d, and only one month later, on November 2d, a large cerebellar abscess was evacuated, which must have been five to six days old then. Regular ophthalmoscopic examination proved to be of considerable clinical importance; at times the increasing optic neuritis was the only phenomenon pointing to intracranial mischief, while all the other symptoms had temporarily disappeared. The development of a distinct "choked disc" with diminished vision is decidedly rare.

**Case 6.—Pyæmia in acute otitis media.**

E. L., thirty-six years old, contracted an acute pain in the right ear, after influenza, on November 23d or November 24th. Incision of membrane. Application of ice. Daily treatment.

*Dec. 7th.*—Mastoid very tender.

*Dec. 11th.*—Sagging of posterior meatal wall. Temperature 102.0°.

*Dec. 12th.*—Severe chill. Temperature 104.2°. Pulse 125.

*Operation.*—Soft parts and corticalis normal. Whole mastoid filled with pus and profusely bleeding granulations. The sinus is laid bare for an inch; its wall appears smooth but somewhat discolored. Puncture is negative. No reaction.

*Dec. 13th.*—Temperature to 102.5°. Pulse 86–110.

*Dec. 14th.*—Temperature normal. Uneventful recovery. Wound healed thirteen weeks after operation.

## OTITIC BRAIN ABSCESS.

BY PROF. V. UCHERMANN, KRISTIANIA.

Abridged Translation by ADOLPH O. PFINGST, M.D., Louisville, Ky.

### A.—STATISTICS AND PATHOLOGY. REPORT OF CASES.

ACCORDING to the statistics of Pitt, brain abscess occurred in 0.62 % of 9000 cases, 40 % of which were of otitic origin. In the Reichshospital of Kristiania, brain abscess was found thirty-five times in 6085 post-mortems, or in about 0.57 % of the cases. In the ten years, from 1892 to 1902, eleven cases of brain abscess originating in the ear were observed, three of which occurred in children. Eight occurred in males and three in females, which corresponds to other larger statistics. In ninety cases reported by Koerner, it occurred in the male sixty times. Three of my cases occurred in acute and eight in chronic suppurative otitis, which corresponds to the observation of Hammerschlag, who gives the proportion as 25 % in acute otitis and 75 % in chronic. The abscess in nine of my cases was situated in the temporal lobe and in the other two in the cerebellum, the ratio agreeing with Koerner's collected cases. Of 267 operated cases, 212 occurred in the temporal lobe. All of the abscesses were situated within 1cm of the surface, and in several it bordered directly on the dura. In three of the cases, pus was found between the dura and the bone. This observation corroborates the statement of Koerner, that otitic brain abscesses are always in close proximity to the diseased ear or bone. In the two cerebellar cases, the connecting link of infection was the sinus. This contradicts the



teaching of Jansen and Koerner, that phlebitis and infected thrombosis play a very unimportant part in the etiology of otitic brain abscesses.

The size of the abscess cavity in my cases varied from that of a hen's egg to that of a hazel-nut. Their contents also varied. Some contained green or yellowish-green thick pus, some a more watery material, and some a very tenacious pus. While the contents was very foul in most instances, in several it was practically odorless. In three of the cases, the abscess was walled off by a pyogenic membrane. The membrane was composed of granulation tissue and was 1mm thick in two of the cases and from 6 to 8mm in the other. The one with the thick capsule took 128 days to develop, the others from twenty-four to thirty-eight days, there being an apparent relation between the length of the period of development and the thickness of the abscess wall. In those cases without a capsule, the cavities were irregular and the surrounding structures soft and at times infiltrated with blood. It seems that the size of the cavity also bears some relation to the duration of the development. In two, or 18 %, of the reported cases, multiple abscesses were found. Koerner in 100 cases reports 15 % of multiple formation. Six of my cases were submitted to operation, with a cure of 50 %. Koerner's records give a recovery in 50.2 % when situated in the cerebrum, and 52.8 % when in the cerebellum.

My cases in brief are as follows:

CASE I.—Male, aged twenty-two, with o. m. p. chron. on both sides. When the patient was first seen, the nasal septum had a perforation about the size of a bean, and behind the perforation, on the floor of the nose, a nodular lupous mass was visible. About two months later, notwithstanding frequent irrigation of the ear, the patient complained of frequent pain behind the left ear, and a modified Stacke was resorted to. After doing well for about a month, the tip of the mastoid became sensitive. The entire process was removed and the patient again improved. Five months later, symptoms of brain abscess developed. The patient became restless, and he complained of pain on the left side of the head. There was some nausea and vomiting, high temperature, aphasia, and the patient seemed in a stupor. The

tegmen of the mastoid was removed and an exploratory puncture made into the temporal lobe to the depth of  $1\frac{1}{2}$  inches, but failed to bring pus. The patient rapidly grew worse and died several days after the last operation.

At the *post-mortem*, almost the entire transverse sinus and some of its branches were found filled with a grayish-yellow thrombus. In removing the brain, the left temporal lobe ruptured, and very near its apex a small abscess cavity, holding about a tablespoonful of foul pus, emptied itself. Portions of the dura contained granular deposits which were recognized microscopically as tubercles. The tubercle bacillus was also demonstrated in the abscess wall.

The points of interest in this case were the tubercular deposits on the dura and around the abscess cavity, and the lupous condition of the nose indicating the nature of the infection. The location of the abscess in the posterior portion of the temporal lobe away from the tegmen and the presence of thrombus masses in the cerebral veins would indicate origin of the brain abscess in this way.

CASE 2.—A boy, nine years old, with history of otorrhœa on left side of several years' duration, had complained of headache for a week when he was admitted to the hospital for treatment. He had had frequent chills, occasional flushing of the face, his appetite was entirely lost, and for several days he had been vomiting occasionally. There had been some swelling behind the left ear for several days. Soon after his arrival at the hospital, he had a convulsion and passed into a state of unconsciousness. His pulse was 92, temp.  $38.5^{\circ}$  C. The pupils were dilated and not responsive to light. The equilibrium of the ocular muscles was not disturbed, but there was a slight ptosis. A large fluctuating mass was present behind the left ear. This was incised and two tablespoonfuls of green fœtid pus evacuated. The mastoid cells were filled with pus and granulation tissue. The sinus was exposed in removing the necrosed bone and was found tense and pulsating. The dura over the tegmen antri and tymp. was also tense. Incision into the dura and brain substance in the median line exposed an abscess cavity. It was 1 cm from the surface and contained  $1\frac{1}{2}$  tablespoonfuls of greenish-yellow foul pus. Drainage tube was inserted. Notwithstanding good drainage, the pulse rate increased to 150 and became irregular, the pupils became contracted; there was some muscular twitching of the lower

extremity. Coma continued, and death followed twenty hours after the operation.

At the *post-mortem*, the abscess cavity was found to be as large as a hen's egg and to occupy the posterior half of the temporal lobe and the anterior end of the occipital. The bone surrounding the tympanic cavity had undergone considerable destruction.

The diagnosis of brain abscess in this case was based upon the history of vomiting followed by a period of quiescence, later repeated vomiting, headache, and finally convulsions and coma. The dilated pupils and ptosis on the left side were aids to the diagnosis. The elevation of temperature and acceleration of pulse before death were evidently due to encephalitis.

CASE 3.—Male, thirty-one years of age, had been suffering for two weeks with acute pains in the left ear and vertex. He had also had chills, elevation of temperature, and vomiting. When admitted to the hospital, he had a subnormal temperature,  $35.8^{\circ}\text{C}$ ., slow pulse, 56, and he was still suffering severely from headache. There was slight drowsiness and apathy. No paralyses or other focal symptoms. Pus was discharging from the left ear canal and the mastoid was slightly sensitive to pressure. The simple mastoid operation was undertaken and pus and cholesteatomatous material found in the antrum and attic. The antrum and attic were cleansed and the posterior wall of the ear canal removed. The condition of the patient improved for several days after the operation, the patient being able to sit up, sleep, and take nourishment; pulse 52, temp.  $36.7^{\circ}\text{C}$ . Headache continued, and on the third day after the operation the patient began to grow worse. He became more drowsy and finally went into coma. His pupils were irregular. No vomiting; no paralyses; pulse 52; temp.  $38^{\circ}\text{C}$ . The urine contained albumen. Death followed in twenty-four hours. An autopsy was not granted.

Although the slow pulse and low temperature indicated brain abscess in this case, the retention of the intellectual faculties, the absence of focal symptoms, and the short duration of the trouble influenced the operator in doing a simple mastoid operation rather than explore the brain.

CASE 4.—A girl, twenty years old, with history of otorrhœa on the left side for two years. For some time there had been pain

in the left ear, chilliness and rigidity of the neck. There was no dizziness, vomiting, or disturbance of motion or sensation. Somnolence was marked, and she would answer questions intelligently, but in a disinterested way. Pulse 100, temp.  $39.3^{\circ}$  C. The ear canal was swollen, thereby covering the drum. The tip of the mastoid was very sensitive to pressure, and the tissue below the bone was indurated and swollen. As the mastoid cells and antrum were, at the operation, found filled with pus and granulation tissue, the entire bone was resected and the posterior osseous wall of the meatus removed. The dura was not exposed. Although apparently less sleepy and with undisturbed intellect on the following day, the patient continued to complain severely of pain in the left ear, temp.  $39.3^{\circ}$  C., and as the day progressed she became more and more restless and complained of dizziness. She finally lost consciousness and died about twenty-four hours after the operation.

At the *autopsy*, a fistulous opening about the size of a large needle was found on the under surface of the temporal lobe, which led to an abscess cavity about as large as a marble, and this in turn communicated with the lateral ventricle. A small quantity of pus was found between the bone and dura. There was no perforation of the bone. The left transverse sinus contained a yellowish broken-down thrombus.

The only symptom in this case indicating the presence of a brain abscess was the stupor, the pulse being rapid and temperature high. Hence the presence of the abscess was overlooked.

CASE 5.—Female, twenty-five years of age, with history of otorrhœa on right side of seven years' duration. For eight days she had complained of severe earache on the right side, accompanied by chills, hot and cold flushes, and headache. There had been no vomiting, but upon arising she complained of dizziness. When admitted for treatment, the patient had a pulse rate of 105, temp.  $39.3^{\circ}$  C. Fœtid pus and cholesteatomatous masses were found blocking the meatus. High temperature, ranging from  $37^{\circ}$  to  $40^{\circ}$  C., continued for several days, pain increased in the frontal and occipital regions, and there was slight stupor. Operation was decided upon. The antrum and attic were found filled with a cholesteatomatous mass, the mastoid cells filled with pus, and pus also escaped from under the bone, where the lateral sinus was



exposed. The entire mastoid was resected. After slight improvement of several days, the patient began to grow worse. The headache became intolerable, especially in the occiput; there was frequent vomiting, and the intellect became more or less clouded. Pulse 60, temp.  $37.3^{\circ}$  C. Two weeks after the first operation, more bone was removed in a backward direction, exposing about an inch of the sinus. It was bulging and its walls were apparently thickened. Free incision evacuated about 100 grams of grayish-green pus. A drainage tube wrapped in gauze was inserted and a bandage applied. Improvement was again of short duration, the headache persisting. The patient soon became more drowsy and at times delirious, and a week later was again subjected to an operation. At this time, an abscess cavity was found in the temporal lobe about 5 cm from the surface and a tablespoonful of pus removed. The symptoms became more and more grave, and five days later it became necessary to again incise the sinus, which was bulging above the point of the first incision. Pus was evacuated. The sinus wall was dissected out as far as the knee. The patient went from bad to worse, the pupils became widely dilated, nystagmus developed, paralysis of the left abducens, aphasia, optic neuritis, and she finally died, five days after the operation, in coma.

At the *autopsy*, one large abscess and several smaller ones were found in the left temporal lobe. The left hemisphere of the cerebellum also contained an abscess as large as a hazel-nut. The ventricles were normal.

The only early indication of cerebral abscess in this case was the sluggish cerebration. After resection of the mastoid, symptoms indicative of cerebellar abscess developed. The pulse became slower, temperature returned to normal, stupor increased, headache continued. There were no focal symptoms. Exploratory incision behind the lateral sinus failed to expose pus, and it was only reached by removal of the sinus wall and exposure of a greater area of cerebellar surface. The abscess in the temporal lobe was evidently secondary to the cerebellar abscess.

CASE 6.—Male, age twenty-six, with history of otorrhœa of short duration on the right side, about six weeks before he was seen at our clinic. For several days before he was seen, he complained of annoying dizziness, chills, pain in the head, especially



on the right side and occiput, muscular twitching, vomiting, defective vision, and a tendency to diplopia. When he arrived at the hospital, most of these symptoms were still present. His mind was clear. Pulse 72, temp.  $37.3^{\circ}$  C. The pupils were dilated, and there was beginning of optic neuritis on both sides. The drum membrane was swollen and there was sinking of the superior-posterior wall of the ear canal. The mastoid was resected, and normal sinus and dura exposed. After several good days the patient grew worse. His pulse became slow, 56; temp.  $37.2^{\circ}$  C.; he became drowsy, and his mind seemed sluggish. Ten days after the operation, an exploratory puncture was made in the temporal lobe with a negative result. Somnolence increased, vomiting became more frequent, and slight coma began to develop. Later there was improvement, the patient being able to sit up, but five weeks after the first operation the temperature suddenly rose to  $44^{\circ}$ , and the patient went into profound coma and died twenty-four hours later.

At the *post-mortem*, an abscess as large as a hen's egg was found on the under side of the right temporal lobe 1 cm from the surface. The lateral ventricles, especially the right one, contained greenish pus, but communication with the abscess cavity could not be found.

Beginning of optic neuritis was the only early indication, in this case, of brain abscess, and as this can be present in many other conditions, especially in serous meningitis, exploratory incision of the brain was not deemed justifiable at the first operation. With symptoms developing after resection of the mastoid, exploratory incision was undertaken although pus was not found. It was shown at the autopsy that the incision had been made directly through the abscess cavity. The tenacious character of the pus and the thickness of the abscess wall had evidently prevented the escape of pus at the time of the incision. The sudden death, after a period of relative improvement, was no doubt the result of involvement of the ventricles.

CASE 7.—A boy, in his twelfth year, whose right ear had been discharging pus for two and a half years, complained, for four days before his admittance to the hospital, of pain behind the right ear and right side of the head. He had vomited several times in the last few days. When examined, the ear canal was found

filled with foul pus, the walls of the meatus slightly swollen, and a large perforation in the drum. His pupils were wide and his eyes had a vacant stare. There was no paralysis or disturbed sensation of intellect. Pulse 90, temp.  $37.5^{\circ}$  C. The mastoid was resected and the antrum and attic, which contained pus and granulation tissue, cleaned out. In removing the bone upward and backward and exposing the sinus, one half teaspoonful of pus was liberated from beneath the bone (epidural abscess). This patient also developed symptoms of brain abscess several days after the operation. He became drowsy, at times comatose, restless, and vomited occasionally. Pulse 64, temp.  $37^{\circ}$  C. His pupils were dilated. Weak hand-grasp on the right side. The skull was trephined posteriorly in the cerebellar region, and an abscess, about 4 by  $1\frac{1}{2}$  cm, located at the depth of 1 cm. The condition of the boy steadily grew worse. He became restless, vomited frequently, and was in a stupor most of the time. Later there was incontinence of urine. Optic neuritis marked. For several hours prior to his death, which took place three weeks after the first operation, he was in a comatose condition, but would frequently shriek aloud.

Three distinct abscess cavities were found at the *autopsy*, all situated in the cerebellum. On the median side of the one found at the operation there was a large one, the size of a walnut, and still farther inward a third one. The lateral ventricles were distended with a serous fluid. The transverse sinus contained a thrombus, which extended to the jugular bulb.

In this case, there were also few symptoms to lead to an early diagnosis, the stare and the vomiting being the only suggestive symptoms. After resection of the mastoid, frequent vomiting, dilated pupils, and weakness of the flexors of the right arm made the diagnosis of cerebellar abscess probable. Although a second search for pus was made when the symptoms continued after the discovery of the abscess, the other cavities were not entered. The restlessness and shrinking noted before the death of the patient were probably due to involvement of the ventricles.

CASE 8.—Boy of sixteen, who has had otorrhœa on the right side for three years, began, two weeks before his admittance to the hospital, to complain of headache and dizziness. A week

before his admittance, he had received a blow on the fronto-nasal region, and since then frontal and occipital pains have been constant. The dizziness also increased; there were great drowsiness, apathy, hot and cold flushes. Vomiting followed every meal. There was no disturbance of motion or sensation outside of constant twitching of the upper lip. When first seen he still complained of headache, and he was restless and morose. Pulse 52, temp.  $36.9^{\circ}$  C. The pupils were normal. The right drum was absent, and foul pus and cholesteatomatous material filled the meatus. The left ear was also discharging pus. Both mastoids were apparently normal.

*Operation.*—Resection of the right mastoid. The antrum was found filled with a mass of cholesteatomatous material. Upward and backward the dura was bare, and also anteriorly a little above the course of the facial nerve. After the operation, the temperature returned to normal, but the pulse remained slow, 56–64. The patient continued drowsy, and complained somewhat of headache. He vomited frequently. Six days after the operation, the dura, where it was exposed behind the sinus, was incised, and a quantity of softened brain matter evacuated. The aspirator was introduced into the brain substance, and at the depth of 1 cm entered a cavity, from which a large quantity of stinking green pus was withdrawn. The bridge of bone between the two exposed surfaces found at the first operation was removed, the abscess cavity irrigated, and a wrapped drainage tube inserted. After twenty-four hours, the symptoms of brain abscess began to abate, following which there was continued improvement and perfect cure, the drainage tube being removed in three weeks.

In this case, the symptoms of brain abscess developed early, headache and dizziness being present for two weeks before the patient was admitted to the hospital, and drowsiness for a week. Vomiting had also taken place, and his pulse was slow, 52, and temperature  $36.7^{\circ}$  C. As the drowsiness and vomiting continued and despondency developed after resection of the mastoid, the abscess was searched for six days later, found, and evacuated. The despondency continued for several days after evacuation of the pus, but the other symptoms subsided almost at once, and the patient made a perfect recovery.

CASE 9.—A lad of seventeen, with history of otorrhœa on the left side of one and one-half months' duration. For the last eight days he had complained of dizziness, frontal headache, and he had had an occasional chill. Pulse and temperature were normal; cerebation clear. The left ear canal was filled with pus, the mastoid tender on pressure. The patient was subjected to a simple Schwartz operation, considerable pus being liberated. The sinus was exposed and found to be covered with granulation tissue. The dura was also exposed anteriorly and upward of the antrum. It appeared thickened and was pulsating. A small fistulous opening was found in it, from which pus was exuding and through which a probe could be passed into a cavity. This opening was enlarged and a quantity of pus and soft brain substance removed. A wrapped drainage-tube was inserted and bandage applied. Symptoms continued for about twenty-four hours, after which he improved rapidly and after several months was discharged in perfect health.

The early symptoms in this case, dizziness and frontal headache, with normal pulse and temperature, seemed insufficient to justify exploration of the brain at that time, and it was only by chance that the abscess was discovered after removing the granulations from the dura and exposing the fistulous opening.

CASE 10.—Male, forty-eight years old, had suffered with intermittent pain in the right ear and a discharge of pus for eleven weeks. He complained of vertigo, difficulty of maintaining his equilibrium, and temporal headache. When examined, there was tenderness on pressure over the tragus on the right side and marked sensitiveness over the tip of the mastoid. The meatus contained pus. Pain was sufficient to prevent sleep. Pulse 64, temperature 36.4° C. In passing the curette inward from the antrum, while doing the Schwartz operation, a small portion of brain substance was removed so that resection of the bone was decided upon. The tegmen tymp. and antri were absent, and a non-pulsating mass covered with thickened dura almost filled the antrum. This was incised and a yellowish-white mass bulged into the antrum. The tumor now began to pulsate. The cavity was curetted and a wrapped drainage-tube inserted. As in the previous cases, symptoms continued for about twenty-four hours and then gradually subsided, the patient making a perfect recovery.



Temporal headache was the only indication of brain abscess in this case. The vertigo and disturbance of the equilibrium being common symptoms of disease of the labyrinth could not be taken into account. As in the preceding case, the abscess was found accidentally during the mastoid operation.

CASE 11.—A child, ten years old, was taken, a month before he was brought to the clinic, with vomiting, fever, headache, and a discharge from the right ear. He apparently recovered entirely from this attack, the otorrhœa ceasing and the temperature returning to normal. When admitted to the hospital he was in a stupor, though when aroused his mental faculties were clear. Pulse 60-70. Somnolence increased in the next two days, the patient lying in bed with his eyes closed. His pulse remained slow. The pupils were wide and reacted slowly to light. Optic neuritis was marked on the left side and was beginning on the right. Outside of a slight ptosis there were no focal symptoms. Emesis had occurred but once. The diagnosis of cerebellar abscess was made and operation decided upon. A partial resection of the mastoid was done and the trephine applied behind the lateral sinus and the dura incised. Aspiration of the right cerebellar lobe brought only a teaspoonful of clear serum. The skull was also trephined in front of the sinus, just over the parietotemporal suture, and the temporal lobe incised, but also with a negative result. After the operation, the pulse rate steadily increased, the temperature rose, and the restlessness became more marked. Five days after the operation, the patient had a convulsion and soon passed into coma, in which he died two days later. At the *autopsy*, an abscess cavity was found in the right temporal lobe 1cm from the surface. The ventricles were free of pus. In the hardened specimen it was found that the abscess cavity was as large as a hen's egg. It was irregular and was surrounded by a dirty reddish pyogenic membrane.

The diagnosis of cerebellar abscess in this case was based upon the drowsiness, slow pulse and normal temperature, vomiting, and vertigo. The puncture made into the temporal lobe just escaped the large cavity found at the post-mortem by 1cm, passing that far behind it. As there were no focal symptoms to denote cerebral involvement, a second puncture was not made. The slight ptosis was probably the



result of an accumulation of fluid at the base of the brain. This is indicated by the rise in temperature and acceleration of the pulse after the operation.

B.—SYMPTOMS AND COURSE.

Clinically the development of brain abscess has been divided into an initial, a latent, a manifest, and a terminal stage. Some authors, among them Macewen, consider the latent and manifest stages as one and recognize but three stages.

The symptoms of the initial stage are headache, evening temperature, with or without a chill, and vomiting. None of these symptoms is constant and we encounter cases where even the headache is wanting (Case 11). The duration of this stage has been placed at from twelve hours to a week. It can readily be understood that the arbitrary limitation of the first stage is of little importance, as it is impossible to determine just when the patient is passing into the next stage.

In the second stage, in which we will include the latent and manifest periods, a diversity of symptoms arises, which, for the convenience of study, have, by v. Bergmann, been classified into three groups. 1. General symptoms dependent upon the suppurative process. 2. General brain symptoms dependent upon the inflammatory process in the brain and the resulting increase in intercranial pressure. 3. Focal brain symptoms dependent upon the direct or indirect involvement of certain areas of the brain or of the cranial nerves.

1. General or constitutional symptoms: Under this head are included malaise, clay-colored complexion, emaciation, constipation, and anorexia. They are especially marked in children. The entire symptom-complex was present in case No. 2, with the exception of constipation, and in Nos. 3 and 8, with the exception of emaciation. In the other cases, only one or several of the symptoms were present.

2. General brain symptoms: Headache is the most pronounced of the pressure symptoms and was present in all but one of my cases. It occurs as a diffuse headache or as

a localized pain, principally in the occiput and frontal region. Sometimes it begins as a general headache and later becomes localized. The location of the pain usually does not correspond to the seat of the abscess, although in hemi-crania the abscess is nearly always situated on the painful side.

One of the most constant symptoms of brain abscess is vomiting. It may be present in the initial stage, the result of septic infection, or it may not develop until pressure symptoms arise. It is most pronounced in cases of cerebellar abscess. It occurred in all but three of my cases.

Dizziness, although not an infrequent symptom, is not as constant a symptom, even in cerebellar abscess. In my seventh case there was no dizziness, notwithstanding the multiplicity of abscesses. This symptom is not believed to be dependent directly on intercranial pressure. In many instances it is the result of simultaneous disease of the labyrinth. When it occurs independent of labyrinthine disease, it is most likely due to irritation of the auditory nerve, or if the abscess is in the cerebellum, to irritation of the middle lobe (vermis).

More or less disturbance of the sensorium is present in every case of brain abscess. It frequently manifests itself first in restlessness, drowsiness, and apathy. Sometimes it is manifested in stupidity (dull cerebration), somnolence, and finally in coma. The patients often become morose, irritable, and hard to please and may have spells of crying. As a rule, questions are answered intelligently when the patient is aroused from his apathetic condition.

Coma may be a temporary symptom and disappear after evacuation of the abscess, unless it be the final coma coming on shortly before death, with rise in temperature and acceleration of pulse, which is usually due to extension into the ventricles.

Convulsions are also common in brain abscess, especially in children. The only two of my cases in which convulsions occurred were in children. In two other cases muscular twitching took place.

An important sign of intercranial pressure is optic neur-

itis. It usually develops in brain abscess after the abscess has attained some size and is consequently considered one of the late signs. As optic neuritis is, in uncomplicated cases, the result of high intracranial pressure, it is also a common symptom of brain tumor, sinus phlebitis, or serous meningitis. The fundus was examined in but six of my cases and optic neuritis found in all but one. The pulse in uncomplicated cases of brain abscess with normal or sub-normal temperature is slow and full after the abscess has attained a certain size. It was slow in all of my cases but Nos. 1, 2, and 4, in which febrile disturbances caused the rapid pulse. As the slow pulse is due to pressure, it usually becomes slow late, about the same time that the optic neuritis develops, after the abscess has attained some size. An interesting feature of the pulse is the increase in rate after evacuation of the abscess.

3. Local (focal) symptoms: Local symptoms are due to (a) direct involvement of certain parts of the brain. The more common of these symptoms are word-deafness and disturbance in speech, when affecting the left temporal lobe, dysphagia, agraphia, and cerebellar ataxia, though none of them is frequent. Amnesic aphasia and paraphasia were observed in two of our cases of abscess of the left temporal lobe. In one of these cases agraphia was also present. Otherwise few symptoms, due to direct involvement of the centres, were observed in my cases.

Local symptoms may also be due (b) to indirect irritation or pressure of the centres. The indirect influence of pressure upon the centres is largely prevented by the presence of the tentorium. It protects the cerebrum when the abscess is in the cerebellum, and *vice versa*. The communicating fissures of the brain also offer a protection, especially as regards the œdema. However, the pressure may be transmitted inward as far as the internal capsule.

Muscular twitching, which is sometimes seen in brain abscess, is now generally looked upon as the result of meningeal inflammation. It usually occurs on the same side as the abscess, but frequently occurs on both sides (Nos. 6 and 11).

Remote pressure symptoms are especially prone to occur

in abscess of the cerebellum. The symptoms are weakness of the hand-grasp, which was present in Case 7, and rigidity of the muscles of the neck, which was observed in both of my cases of cerebellar abscess, and also in two cases of cerebral involvement (Nos. 3 and 4). This muscular contraction is believed to be a reflex action, having its cause in an irritation of the membranes of the cerebellum.

Another cause of local symptoms is (c) indirect involvement (pressure) of the cranial nerves within the skull. Instances of this kind were observed in Cases 2 and 11, where oculomotor paralysis was manifested in ptosis on the same side of the abscess. In Case 5, there was paralysis of the abducens nerve, also horizontal nystagmus. The lesion in this case was probably near the centre of associate eye movements in the corpora quadrigemina. Symptoms denoting involvement of the 4th, 5th, 7th, or 12th nerves were not noted in my cases.

The third, or terminal, stage of brain abscess is manifested in coma, with or without convulsions, and usually terminates in paralysis of respiration. This stage may come on suddenly, being ushered in with a chill, fever, rapid pulse, severe headache, and vomiting. In such cases, it is due to rupture of the abscess into one of the lateral ventricles or the subarachnoid space. Where rupture takes place into the arachnoid space, the comatose condition develops more slowly than in case of rupture into the ventricle. The terminal stage may come on gradually, the condition of somnolence slowly passing into coma, so that the beginning of this stage can not be well defined. Cases 4 and probably 3 illustrate the rapid development of coma, result of rupture of the abscess into the ventricle. In the other cases, progressive encephalitis was the cause of death. In Cases 1, 7, and 11, coma was not present.

In two of the cases of cerebellar abscess, and in one of the cases of abscess of the temporal lobe, complications were found in the form of sinus thrombosis. The cerebellar cases were also complicated by subdural abscess. Two other cases (Nos. 4 and 6) of abscess of the temporal lobe were complicated with meningitis.

## C.—DIAGNOSIS.

The diagnosis of otitic brain abscess, which is nearly always difficult, is, in uncomplicated cases, based upon the history of an acute or a chronic suppuration of the middle ear, and on the gradually increasing symptoms of intercranial pressure, and on the drowsiness, absence of fever, slow pulse, and vomiting. This symptom-complex may also be observed in serous and tubercular meningitis and in tumors of the brain, which makes a positive diagnosis practically impossible without resorting to exploratory surgical means. By resecting the mastoid, the condition of the bone and the adjacent dura can be determined. Sometimes a fistulous opening leads to the discovery of the abscess, as in Cases 9 and 10. The operation also discloses the presence of sinus thrombosis, epidural abscess, and caries of bone adjacent to the dura, when present, indicating thereby the course of the infection (Nos. 5, 7, and 8). The dura, when exposed, usually bulges, but does not pulsate. In the beginning of the development of brain abscess, or in the event of a small abscess, the symptoms are ill-defined or may be wanting entirely, making a diagnosis impossible, unless the cavity is found accidentally during the mastoid operation. In children, the symptoms are especially obscure. The inflammatory or irritative symptoms, as fever and vomiting, may be present, but these can not be considered characteristic, unless accompanied by other more suggestive symptoms. In the terminal stage, the diagnosis can usually be made, though, unfortunately, it is then too late to be of value. In addition to the inflammatory symptoms of this stage, coma comes on suddenly with a rapid rise in temperature and is soon followed by death. The development of local symptoms makes the diagnosis easier as well as the being an aid in determining the location of the abscess. Aphasia, with or without associated disturbance of the opposite side, would indicate the location of the trouble in the left temporal lobe, while crossed paralysis of the extremities would indicate involvement of the motor areas in the temporal lobe, and paralysis of the parts supplied by the cranial nerves would



indicate pressure at the base of the brain. Local symptoms are so infrequent when the abscess is situated in the cerebellum, that in cases of primary disease in the posterior part of the mastoid or in the labyrinth, with symptoms of abscess, the absence of focal symptoms is by some considered a strong evidence that the seat of the abscess is in the cerebellum. However, the fact must be kept in mind that even in large abscesses of the temporal lobe focal symptoms may not arise (Nos. 6 and 8).

The differential diagnosis between brain abscess, especially of the cerebellum, and serous meningitis presents great difficulties owing to the similarity of symptoms. Although the history of otorrhœa would favor the presence of abscess, it can also be present coincident with serous meningitis, and a differential diagnosis is often impossible without making an exploratory puncture. It is equally difficult at times to differentiate between brain tumor and tubercular meningitis, with coexisting suppuration of the middle ear. Tubercular meningitis may run its course with elevation of temperature and with slow pulse. The diagnosis in these obscure cases can only be made by exclusion, and to accomplish this a resection of the mastoid bone becomes necessary. If the bone itself is found healthy and the disease limited to the antrum or the attic, the presence of brain abscess is not very probable. The nature of the meningeal exudate when present can be determined only by exploratory puncture and microscopic examination. If due to serous meningitis, the puncture is nearly always followed by marked improvement; not so, however, in tubercular inflammation.

To differentiate between brain abscess and tumor of the brain, with coexisting suppuration of the middle ear, which may simulate abscess, most importance must be attached to the duration of the development. In tumors of the brain, the symptoms develop much slower than in abscess, and they are, as a rule, accompanied by more pronounced optic neuritis (often pronounced choked disc), more frequent blindness, and by slow and progressive involvement of the cranial nerves.

## D.—PROGNOSIS.

Unoperated cases of brain abscess always terminate fatally. Even in the event of the formation of a fistula, the drainage is insufficient, and death will result sooner or later, the result of a progressive encephalitis. Early operation with thorough cleansing of the cavity and careful drainage make the prognosis relatively favorable. In cured cases it is the rule for perfect mental and physical functions to be retained.

The direct method of searching for abscesses is also to be preferred when, on account of coma, chiselling is considered dangerous; also if a very large abscess is suspected, or if the abscess is believed to have its seat in the cerebellum.

After the dura has been exposed, its condition must be carefully studied. It should be noted whether or not it is injected, whether discolored or covered with granulations, and whether the sinus shows signs of thrombus formation. It should also be observed whether or not the dura is pulsating. This can be determined only when a rather large area of dura has been exposed. Pulsation of the dura does not necessarily exclude the possibility of an abscess, for pulsation may be present if the abscess be very small or deep-seated. On the other hand, pulsation may result from increased pressure from other causes, as hydrocephalus externus, hydrops of the ventricles, œdema, etc. It is a good rule whenever the dura appears healthy and symptoms suggestive of brain abscess are not marked—that is, if there are no local symptoms, no coma, and only the general symptoms of intracranial pressure, as slow pulse, headache, etc.—to await the result of the mastoid operation before incising the dura and exploring the brain. Experience teaches us that brain symptoms often accompany suppuration of the middle ear, especially in children, and that they disappear as soon as the disease in the ear is relieved. In considering the influence of the pulse on the question of operation, it is well to keep in mind the fact that some people, especially phlegmatic men, normally have a slow pulse, sometimes as low as 65, and that slow pulse is not positive evidence of intercranial pressure.

## E.—TREATMENT.

The progress in the treatment of brain abscess in late years is due above all to the fact that operators do not now await the development of local symptoms but in doubtful cases rather make an exploratory puncture. The present method of treating abscesses surgically has also much to do with the success of these cases. In all but a few exceptional instances, the diseased portions of the mastoid bone are removed by performing a mastoidectomy, and the brain substance is explored through the exposed surfaces. The bone is partially or entirely resected according to circumstances. Partial resection is justifiable in cases where the middle-ear disease has previously run its course, where a fistulous opening is found leading to the abscess, or where the symptoms indicate trouble in the cerebellum. In all other cases, it is best to sacrifice the ossicles and to remove the posterior wall of the meatus in order to be able to thoroughly inspect the tegmen of the attic and antrum. If need be, the roof of the attic and of the antrum can eventually be removed and the dura exposed. During the resection of the mastoid, all granulations are carefully removed as far as they can be traced.

If the diseased ear is the only one with retained function, or if the function is much more acute than on the other side, the radical operation would hardly be justifiable as it is nearly always followed by deafness. In such cases, the direct exposure of the brain at some other point, with subsequent exploration of the brain substance, is the preferable method of procedure. As delay in evacuating a brain abscess may cost the life of a patient, a considerable area of dura should be exposed at the first operation so as to make a rapid exploration of the brain without an anæsthetic possible, should brain symptoms continue after the first operation. If this precaution had been taken in cases No. 3 and 4 of my series, the exploratory puncture of the brain would certainly have been undertaken much earlier, as pressure symptoms, especially the slow pulse, remained unchanged for some time after the first operation.

The method which I employ to explore the brain is to make a small incision in the dura with a pointed knife and lift the dura from the brain with a sharp hook to prevent injury of the vessels of the pia mater. The incision is then enlarged in a linear direction and a small incision made at right angles to the other, meeting it at its middle. Puncture of the brain through the unopened dura should never be practised, as pus, if present in the meninges, would be carried into the brain substance. There would also be danger of severing a large vein under the dura, causing a clot which might be overlooked. After making the incision into the brain substance, a pair of long thin forceps (a special pair devised by Péan is best) is introduced with the blades together, then opened and withdrawn with the blades apart. This enlarges the canal sufficiently for the thickest pus to be discharged. In this manner a methodical exploration is made in different directions. In the temporal lobe, puncture is first made straight upward, then backward, and then forward. Care must be exercised not to penetrate deeper than 4cm to avoid wounding the medulla or entering the lateral ventricles.

In exploring the anterior surface of the cerebellum at a point behind the antrum and sinus, the punctures should be made directly backwards, and backward and outward.

In cases of thrombus of the lateral sinus, it is good practice to remove the contents of the sinus, and after disinfecting with alcohol and 5 per cent. carbolic solution for five to ten minutes, to split the posterior or inner wall and make the exploratory brain puncture (Case 5).

To reach the posterior external part of the cerebellum for puncture, an opening is made in the occipital bone between the lateral and occipital sinus.

The various trocars (Macewen's searcher), syringes, and scalpels which have been used in exploring the brain for abscesses have, in my hands, been unsatisfactory and I have about discarded all of them. The operation of exploring the brain substance is not looked upon as a procedure of any consequence when carried out under antiseptic precautions, yet cases may occur where it results unfavorably.

This is especially true in cases where a number of futile efforts are made to find the abscess before it is located. If drainage is not good in such cases, secondary abscesses may develop along the line of one or several of the punctures. In my case No. 5, it would have been better had the temporal lobe been left unexplored. It is evident that the smallest number of punctures possible should be made in searching for pus in the brain substance, and this can best be accomplished by adhering to the routine method previously referred to. After the abscess has been found, drainage should be made as perfect as possible by splitting the wall of the abscess cavity as wide as possible. It is also permissible in cases of very large abscesses to make a counter opening and flush the cavity with warm antiseptic solutions. Macewen has suggested that instead of making a counter opening two drainage tubes be inserted, the smaller one to inject the fluid and the larger one to serve as the outlet. Case No. 8 was treated in this manner. Larger necrotic areas will have to be removed by opening and closing a pair of forceps in the wound. In small superficial cavities, adherent necrotic masses may be removed with a curette. Inspection of the abscess cavity with reflected light, to determine whether the surface of the cavity is smooth, is practically impossible, as the soft brain substance crowds into the opening. Palpation with the finger is also of little value, the soft tissue all making the impression of one pulpy mass.

After the abscess cavity has been cleansed as thoroughly as it will admit, a drainage tube wrapped in iodoform gauze should be inserted. It is important to have the end of the tube which is to be inserted into the abscess covered by gauze. In this way it acts as a sieve, allowing fluids to drain and the necrotic tissue to remain. This is removed at each dressing by introducing forceps as previously described. The tube should be introduced just far enough to allow the end to pass into the cavity. It is then sutured to the skin to prevent it from slipping in either direction, the wound powdered to prevent the bandage from adhering, covered by gauze, and bandaged.



Ordinarily the bandage may be allowed to remain three to four days before changing the dressing. At the dressing, the tube is removed and the cavity examined. This is repeated every three or four days, and usually after about twelve days the drainage tube can be left out. In cases where the pus is very abundant or offensive, the wound should be dressed every day and the tube allowed to remain three to four weeks (No. 8).

During the entire course of treatment, it is essential that the patient remain in the recumbent position. Macewen warns against allowing patients to leave their beds too early, having had a fatal case result in this way.

## A PHONOGRAPHIC ACOUMETER.<sup>1</sup>

By W. SOHIER BRYANT, M.D., NEW YORK.

*(With five text-cuts.)*

NO instrument or contrivance previously devised furnishes an adequate substitute for the human voice for testing hearing. It is impossible, however, to repeat a test made in the ordinary way with the human voice. Practice diminishes the variation which the voice has at different times, but never overcomes it entirely. It is still more impossible for an individual to even approximately repeat another's previous test of hearing for the human voice. The phonographic acoumeter alone gives an absolute and unvarying test of the hearing for the human voice, the lack of which has long been a stumbling-block in the path of the otologist. The tests with this acoumeter are susceptible of less variation or error in their application than with other methods. The results obtained by other methods are inexact, owing to indistinctness of articulation, imperfect closure of the other ear, changes in the position of the acoumeter and watch, the varying angle at which the tuning-fork is held, unequal force of the initial blow, etc.

The phonographic acoumeter invented by me overcomes all difficulties, for it can be manufactured in large numbers with perfect accuracy, and the pitch and intensity of its mechanical human voice do not vary. The voice produced by the machine has a constant intensity and pitch, the intensity being under accurate control of the operator, who can modulate it from the loudness of the voice when a speaking-tube is used, down to zero. In this way the machine allows the operator to determine accurately the limit at which the patient is able to hear sufficiently distinctly to repeat the words spoken by the machine.

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<sup>1</sup> Demonstrated at meeting of American Otological Society, in Atlantic City, N. J., July 11th.

Distance is no longer needed for the voice tests. Even a patient with abnormally acute hearing can undergo satisfactorily all the voice tests in the smallest office. The sound-proof box prevents any of the sound reaching the patient, except through the tubes, which are under absolute control of the operator.

This acoumeter provides a sure method of detecting simulated deafness. When the malingerer feigns deafness in only one ear, the three-way valve, turning the sound on and off for the ears, rapidly alternating or simultaneously, distracts the patient, and prevents replies consistent with any considerable degree of real deafness.

The present methods of testing do not allow the determination of slight degrees of deafness, which is a very serious matter for the patient, as all otologists know that progressive deafness, if taken in time, offers more encouraging prognosis than when the hearing is already lost to a considerable degree.

This apparatus not only allows the recognition of the slightest diminution in hearing, but it also gives accurate tests of the quantity of hyperacusis, when it is present. It is the best means of giving a kind of massage which has been recommended of late, when, instead of regular pneumatic pulsations, sound vibrations are used; for this acoumeter furnishes the kind of passive motion to which the ear is normally most called upon to respond. The machine also gives the means of exercising the hearing power in the very deaf, which may help the hearing function, prevent its being wholly lost, prolong it, or even sometimes improve it.

The tests obtained by the use of this acoumeter can be directly compared in the same way that an ophthalmologist compares his visual tests with the assurance that the tests in every case are practically accurate.

*Construction.*—Fig. 1. An Edison standard phonograph<sup>1</sup> (*A*), fitted with a rubber tube (*a*), is placed in a sound-proof box (*B*) made of sheet lead. The tube (*a*) leads the sound out through the box wall. A brass graduating valve (*C*) is attached to the distal end of the rubber tube (*a*). This valve serves to regulate

<sup>1</sup> The Standard Phonograph Company, Orange, N. J., U. S. A., makers.

the volume of sound conveyed to the ears of the patient. The graduating valve has a central inlet (*b*) and a side outlet (*c*).

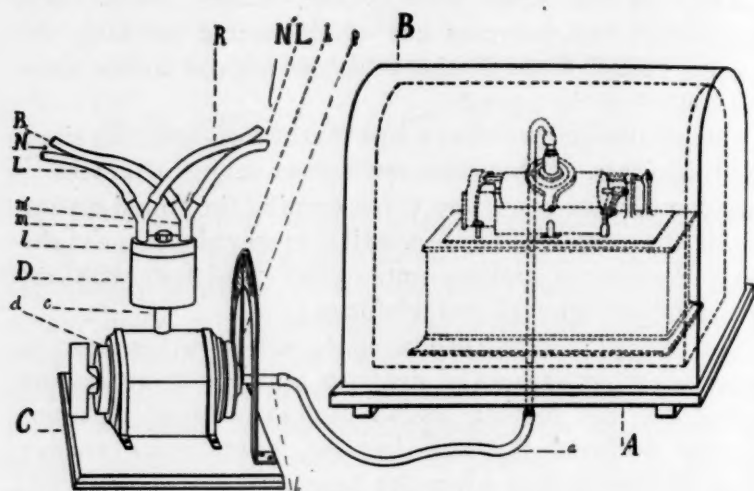
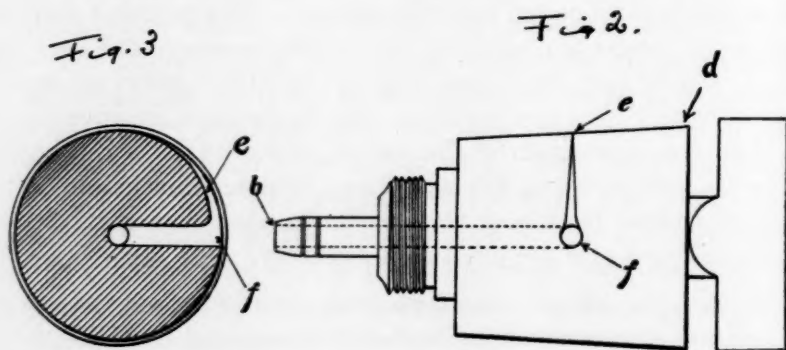


FIG. 1.

The plug (*d*) of the valve (*C*) (see Fig. 2) has a groove (*e*) on its surface leading from the side of the plug outlet hole (*f*). The groove (*e*) is made like the section of a bent cone with its base at the hole (*f*) and its axis extending for  $90^\circ$  over the surface of the plug (*d*). Fig. 3 shows the plug (*d*) in section through the tapering cone (*e*) and the outlet (*f*). The tapering



cone (*e*) serves to gradually close the passage of the sound through the graduating valve (*C*). This valve (*C*, Fig. 1) is fitted with an indicator needle (*g*) and dial (*h*). The needle

is attached to the rotating plug (*d*). The dial is an arc of  $100^{\circ}$ . The reading on the dial indicated by the needle gives the proportionate amount of sound reaching the patient's ears  $0^{\circ}$  when all the sound reaches the patient, and  $100^{\circ}$  when

Fig. 4

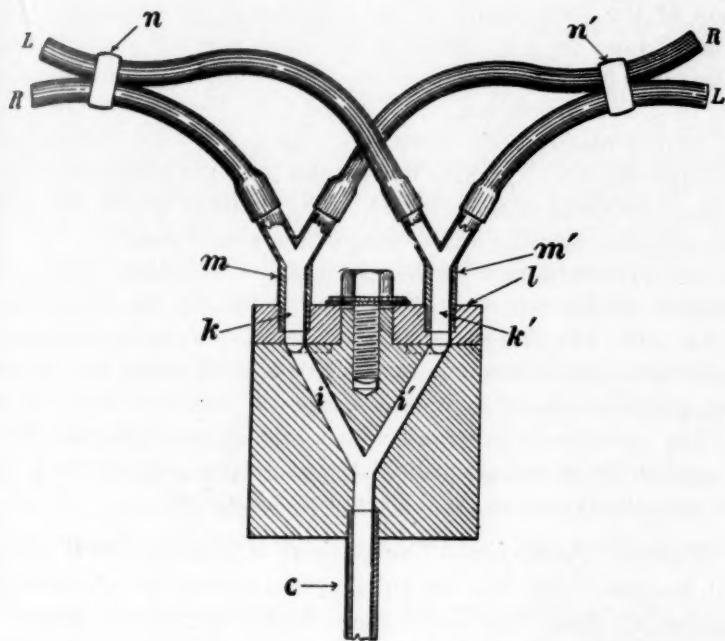
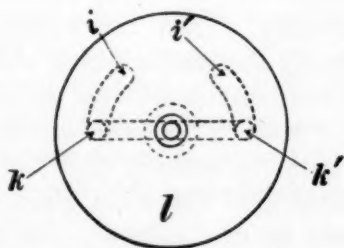


Fig. 5.



no sound [goes] to the patient. After leaving the graduating valve, the sound is conveyed to a three-way brass valve, called the malingerer's valve (Fig. 1, *D*; Fig. 4), which has one inlet (*c*) and two outlets (*i* and *i'*), cut in such a way that rotation of



the disc ( $I$ ) will open or close the outlets singly, alternately, or simultaneously. The outlets ( $i$  and  $i'$ ) correspond to the passages ( $k$  and  $k'$ ) in the disc ( $I$ ), which are fitted with Y tubes. The two arms of the Y-tube ( $m$ ) are each fitted with a rubber tube; one of the tubes goes to the limb of a stethoscope intended for the patient's right ear, and the other tube, in a similar way, to the limb of the stethoscope for the right ear of the operator. The other Y tube ( $m'$ ) is rigged in the same way for the left ears. The tubes for the patient are ( $n$ ), and the tubes for the operator are ( $n'$ ), both rights and lefts (R and L). Fig. 5 shows the disc ( $I$ ) of the malingerer's valve ( $D$ ). ( $k$  and  $k'$ ) are the passages through the disc ( $I$ ) which correspond with the elongated openings of the forks of the inlet ( $c$ ). The shape of ( $i$  and  $i'$ ) allows the alternate opening and closing of the sound passages.

The cylinders used in the phonograph are made from permanent master records. They can be readily replaced when worn out. The records are made from carefully selected monosyllabic words in common use, with special reference to the logographic value of their consonants.

The operator is provided with a slip of paper, on which the words of the record are printed, to enable him to check the words as the patient repeats them after the phonograph.

*Mode of Operation.*—The patient is instructed to repeat all he hears, and his ear tubes are adjusted in his ears, the operator taking his own tube. The indicator is placed at  $100^\circ$  on the dial, and the phonograph is started. The operator slowly moves the indicator until the patient remarks that he hears but does not understand, or repeats the words incorrectly. Then the operator, still moving the indicator, checks the words which the patient repeats correctly on the word list previously provided. When the patient repeats at least 75 % of the words correctly, out of ten or fifteen words, the scale is read and the test is completed. The reading of the scale gives the acuteness of hearing possessed by the patient. To get the absolute hearing, this number should be squared and multiplied by the percentage of words accurately repeated. A quick way of writing it is in the form of a fraction, the numerator being the reading of the scale, and the denominator the percentage of words repeated. The ears are tested separately

by adjusting the three-way valve for the separate ears. Normal hearing for adults ranges between  $70^{\circ}$  and  $80^{\circ}$ . Hyperacusis ranges above  $80^{\circ}$ .

In order to test unilateral malingerings, the indicator is placed at a point at which the patient hears readily by both ears together, and the operator quickly changes the three-way valve with his left hand, cutting off one or the other of the ears, but never both at once. At the same time he marks the words repeated correctly by the patient, with R for the right ear, and L for the left ear, and B for both ears, or similar symbols. The result will show conclusively, first, that the patient can hear, and second, that hearing of the two ears bears a constant proportion one to the other. If the patient suspect some trick, the relative proportion will be irregular, for no patient can be quick enough to detect accurately every change in direction of the sound. The hearing for the good ear alone must equal in accuracy the hearing for both ears together, if the bad ear is deficient to any considerable degree.

It will be noticed that in a rapidly repeated test the hearing of the patient, especially in cases of adhesive processes in the middle ear, decreases very noticeably, while a rest will usually restore it.

Should the patient become sufficiently familiar with the words on the cylinder to be able to supplement the defects in his hearing by his memory, an incident not likely to occur, unless the operator has allowed the patient to hear much more of the cylinder than the hearing tests required, a new cylinder can be substituted for the old one in a few seconds. This second cylinder is possible, because the skill of the experts of the Edison Company has reached such a point that, out of a few different records, two can be easily selected having practically the same pitch and intensity.

#### SUMMARY.

The Phonographic Acoumeter gives accuracy in hearing tests not hitherto attained.

It furnishes a universal standard, whose records are always comparable.

REPORT ON THE PROGRESS IN OTOLOGY DURING THE THIRD QUARTER OF THE YEAR 1903.

BY DR. ARTHUR HARTMANN.

Translated by Dr. ARNOLD KNAPP.

MIDDLE EAR.

(Concluded from page 361.)

d.—OTHER MIDDLE-EAR DISEASES.

323. **Stern.** Immobility of the stapes in the oval window. *Inaug. Diss.* Freiburg i. Br. Univ. Ohrenklinik zur Freiburg i. Br. Wiesbaden, 1903, J. F. Bergmann.

324. **Roure.** The clinical study of the diagnosis and treatment of the chronic middle-ear catarrhs, called "dry," of naso-pharyngeal origin. *Ann. des mal. de l'oreille, du larynx*, 1903, No. 2.

325. **Stenger.** On the etiology and treatment of sclerosis of the middle ear. *Deutsche med. Wochenschr.*, No. 29, 1903.

326. **Shepard.** A few remarks on some every-day ear cases. *Brooklyn Med. Jour.*, July, 1903.

323. After an historical introduction, the pathology of stapes ankylosis is fully described, including the various histological descriptions of stapes ankylosis which have been heretofore published (Katz, Bezold-Scheibe, Politzer, E. Hartmann, Siebenmann). The etiology and symptomatology are then described. In the chapter on hearing, seven cases are grouped which had been examined during life, and autopsy revealed ankylosis of the stapes. Gelle's test is carefully discussed. Its value is shown by a number of case-histories. The paper is written with extreme industry and unusual lucidity, and should demand the interest of all otologists.

BRUEHL.

324. ROURE distinguishes the changes of middle-ear catarrh as occurring in three stages: the hyperplastic form, the dry, and the atrophic. The diagnostic features of each one of these stages is described. The author is unusually optimistic about the results of passing the bougie in the Eustachian tube, the electrical air-pump irrigations and painting of the naso-pharynx, and general dietetic rules. ZIMMERMANN.

325. The author believes that sclerosis of the tympanic mucous membrane in most of the cases is an inflammatory process which extends from the nose and its adnexa through the Eustachian tube. NOLTENIUS.

326. The author analyzes one thousand cases, giving 1581 diagnoses; of these, 658 concern the middle ear; of these, 134 were chronic catarrhal otitis media. The internal ear alone was involved 57 times, and in 177 there was mixed middle- and internal-ear disease. Forty was the age of the greatest number of patients. The author concludes that the strain of active life accounts for this.

He suggests early treatment for all nasal and pharyngeal affections, which may later cause deafness.

The absence of telephone-operating from the list of occupations of the patients is noteworthy. BRYANT.

#### THE NERVOUS APPARATUS.

327. **Alexander.** On the pathological significance of endolymphatic hemorrhage in the labyrinth. *A. f. O.*, vol lix., p. 13.

328. **Bloch.** On galvano-therapy of Ménière's symptom-complex. *Prager med. Wochenschr.*, 1903, No. 20.

329. **Alt.** On disease of the auditory nerve after excessive indulgence in alcohol and nicotine. *M. f. O.*, 1903, No. 4.

330. **Fragstein.** On bilateral disturbance of hearing combined with bilateral facial convulsions, with remarks upon the distribution of the latter. *Wiener klin. Wochenschr.*, No. 38, 1903.

331. **Pick.** On the functional inhibition of the acoustic speech centre in the left temporal lobe. *Wiener klin. Wochenschr.*, No. 38, 1903.

327. ALEXANDER has investigated this question on 110 labyrinths of adult animals and 86 embryos. The animals were all killed with chloroform. The endolymphatic hemorrhage, according to the author, is the result of suffocation—just as the frequent perilymphatic hemorrhage of the labyrinth and hemorrhage in the tympanum. The view of Kirchner, who has re-

garded the endolymphatic hemorrhages as the result of the action of quinine or salicylic acid in his experiments, is untenable. Wittmaack's investigations have shown changes in the ganglion of the auditory nerve in animals poisoned with quinine.

HAENEL.

328. The author recommends galvanization directly through the skull in treatment of the Ménière symptom-complex. This method was regularly applied in two cases, with complete recovery; in two others a marked improvement took place.

PIFFL.

329. An author's abstract of this paper has appeared in a preceding number of these ARCHIVES, in the report on the 73d Congress of German Scientists and Physicians in Carlsbad.

330. A patient, fifty-nine years of age, was taken ill two years ago and suffered from increasing deafness, vertigo, and spasmodic contractions in the distribution of the facial nerve. The symptoms are supposed to be due to an aneurysmal condition in the base of the skull, probably of the posterior cerebellar artery. It is noticeable that the secretion of the lachrymal gland and the elevator of the soft palate were influenced by the disease of the facial nerve.

WANNER.

331. Report of a patient, sixty-five years of age, with pronounced paraphasia, with absent word-deafness, disturbance of writing, with partially preserved ability to read; amnesic aphasia, closely allied to optical aphasia, was present. Diagnosis of the lesion of the left temporal lobe, with absent or slight involvement of the first temporal convolution, was confirmed at autopsy. A carcinoma of the bronchus, with numerous metastases in all parts of the brain, was found. One of the nodules made a deep impression over the left temporal lobe.

PIFFL.

#### NOSE AND NASO-PHARYNX.

##### a.—GENERAL.

332. **Porcher.** Facial neuralgia; six cases due to diseases in the nose and antrum. *The Laryngoscope*, August, 1903.

333. **Kikuchi.** On the histology of bone cysts in the nose, with remarks on their development and origin. *Arch. f. Laryngol.*, vol. xiv., p. 308.

334. **Bresgen.** The glandular hypertrophies in the upper pharyngeal cavity and the permanent swelling of the nasal mucous membrane in their relation to each other and to the mental development of the child. *Die Gesundheitswarte des Kindes*, i., 1903, No. 9.



335. **Citelli.** On regeneration of the nasal mucous membrane in man. *Arch. f. Laryngol.*, vol. xiv., p. 350.

336. **Trautmann.** Relation of the nose and the genital organs. *M. f. O.*, 1903, No. 4.

332. **PEYRE PORCHER** claims that facial neuralgia is frequently due to disease of the nose and of Highmore's antrum. In Case 1, the neuralgia was caused by pressure of the hypertrophied turbinates; in Case 2, by inflammation of the antrum. In Case 3, the septum was crushed, pressing upon the turbinates, with complete occlusion of that nostril and inflammation of the antrum. In Case 4, severe and aggravated neuralgia had persisted after removal of the Gasserian ganglion, but disappeared after correction of septal deformity and removal of pus from the antrum. In Case 5, the septum was crushed and the antrum engorged. In Case 6, the septum was corrected and the antrum opened after preliminary removal of the Gasserian ganglion.

M. TOEPLITZ.

333. Fifteen bone cysts were examined, of which four were derived from cadavers and eleven from living persons, and one from an embryo, four months of age. The author concludes as follows: (1) The bony cyst occurs in the cartilaginous period of the foetal turbinates. This case points to the fourth month, and it can be regarded as an aberrant ethmoid cell, situated in the middle turbinate. (2) The condition of the internal mucous membrane of the bone cyst is identical with that lining the ethmoid cells. Their mucous glands are located about the opening of the cyst. (3) The dilatation and thinning of the bony wall of the cyst are the result of a resorption following an inflammation which is running its course.

ZARNIKO.

334. This is a popular paper on the important relation of nasal occlusion with the mental condition of especially neurasthenic children. The author does not remove the entire pharyngeal tonsil. He has, nevertheless, not observed any relapses, because he always follows the operation with appropriate treatment of the nose. If the nasal swelling be not attended to, a relapse is liable to occur.

BRUEHL.

335. The patient's lower turbinates required operation. Small fragments were cut away, and then, after 2-60 days, larger fragments, which included the previous wound, were removed and examined microscopically; wound healing could thus be examined, step by step. After describing the various features, the

author states that after removal of the superficial parts of the nasal mucous membrane, by which the deeper layers are enlarged, the anatomical condition of the mucous membrane shows only slight changes as a result of the proliferation process which takes place after operation. The glands and the cavernous bodies remain; in place of the loose tissue the superficial layers of the connective tissue appear. The bone is not changed. The scar presented a retraction at the surface, which is of good influence. The entire removal of the turbinate is unnecessary and to be rejected. ZARNIKO.

336. The author has endeavored to solve the hitherto unexplained relationship between the nose and the genital sphere on an anatomical and physiological basis. He gives a drawing of the nerve paths which serve to connect the two regions. In the remarks which follow, the author, in addition to the so-called genital areas as described by Fliess, states that others must be present in the nose, as every other mucous membrane, and even the external skin, possesses analogous areas which may form a reflex arch with the sexual sphere. PIFFL.

#### b.—METHODS OF EXAMINATION AND TREATMENT.

337. **Onodi.** An olfactometer. *Arch. f. Laryngol.*, vol. xiv., p. 185.

338. **Hirschmann.** On endoscopy of the nose and of its accessory cavities; a method of examination. *Arch. f. Laryngol.*, vol. xiv., p. 195.

339. **Hurd and Holden.** A case of paraffin injection into the nose, followed immediately by blindness from embolism of the central artery of the retina. *Med. Record*, July 11, 1903.

340. **Stein.** On the use of hard or soft paraffin for subcutaneous injections. *Deutsch. med. Wochenschr.*, No. 37, 1903.

341. **Boye.** On intranasal vaporization. *M. f. O.*, 1903, No. 6.

342. **Delsaux.** Preliminary note on the treatment of lupus of the upper respiratory passages with radium. *La presse oto-laryngologique*, vol. 1903, Part 18.

337. This consists of a glass tube with a smaller nasal end and a lateral diverticulum, which contains a cotton plug soaked in the fluid. ZARNIKO.

338. The description of an apparatus constructed on the principle of Nitze's cystoscope. This has been used with advantage in endoscopy of the maxillary cavity of the ethmoid cells and of the naso-pharynx. The paper is illustrated by six colored pictures. ZARNIKO.

339. The patient, aged thirty-four, was injected three times with paraffin for a saddle-shaped nose: first, into the depressed parts below the nasal bones; secondly, after six weeks, about an inch from the tip on the right side; both injections without untoward results; thirdly, more than five months later, near the site of the second injection. The needle was at first introduced at the tip, pushed upward, and then, at the root of the nose, pushed down to a spot just about the former injection. The patient was now seen to rub his eye; he complained that he could not see with it. A little later, ecchymoses appeared about the tip of the nose, indicating that a vein had been punctured. Twenty-five minutes later, HOLDEN examined: Pupil of the right eye large, not responding to light. Subjective sensation of objects swimming about in the entire field of vision, but objectively unable to distinguish between light and dark. Media and retina clear; retinal veins normal. The main inferior branch of the central artery of the retina and its divisions were empty and collapsed. The main superior branch contained some blood, but upon gentle pressure on the eyeball the blood column broke up and the blood flowed backward into the central artery. Two hours after the first inspection, the white disk had become slightly blurred at its margins, and the retina about the larger vessels was hazy. Repeated massage had forced the blood out of both arteries and veins, so that the retina was entirely bloodless. Three hours later, the blood had returned to the veins and the superior artery was partly filled, but pressure at once emptied all vessels near the disk, while in the periphery thin blood columns persisted, although in many vessels they were broken. The retina was now œdematous, and the usual red spot near the macula well marked. No improvement in vision took place later on. The plugging of the retinal arteries is chiefly due to endarteritis obliterans. A good review of the literature concludes the paper.

M. TOEPLITZ

340. This paper is principally directed against Eckstein, who employs paraffin which melts at about 60 degrees. The author, from observation of patients and experiments on animals, comes to the following results: The danger of pulmonary embolus is practically to be excluded if the method is properly applied; if, however, it be conceded, it will surely be greater with hard paraffin than with soft paraffin. The technique in that case is very much more difficult, and the danger of burning the tissues

and necrosis of the skin, in consequence of the extreme distension from the injected hard paraffin, is present. If too much of the soft paraffin has been injected, a certain part of it can still be squeezed out of the point of injection after some hours. Though this in course of time is not absorbed, connective tissue grows through it, and thus forms an ideal substitute for the lost tissue. Hard paraffin, on the other hand, encapsulates and always remains a foreign body at the site of injection. Paraffin injections are especially serviceable to correct small and superficial deformities. Only small quantities are to be injected; if large quantities are necessary, other methods should be used. Stein's mixture consists of vaseline and paraffin, melting at a high point. It has a boiling point of about  $41^{\circ}$  C. It must be sterilized before being used, put in a water bath, and injected not in a fluid but in a pasty condition. NOLTENIUS.

341. The author has treated a number of cases of ozæna and chronic atrophic rhinitis, with and without an involvement of the accessory cavities, and a patient with hypertrophic rhinitis and suppuration of the antrum of Highmore with the intranasal vaporization of Berthold. The result in the first-named diseases was relatively favorable; the accessory-sinus affections were not influenced. The number of empyemata thus treated are too few to give an opinion on the value of the method.

PIFFL.

342. This is a preliminary communication on the attempts to treat lupus with radium rays. Some pure radium, in a small glass bulb, is attached to the laryngeal mirror. To treat the nose and the pharynx, a glass ball was fastened to a straight probe. After nineteen applications of it, each lasting forty-five seconds, the result is supposed to be satisfactory and the author is convinced of the curative value of the new measure.

BRANDT.

## C—OZÆNA.

343. **Rethi.** The electrolytical treatment of ozæna. *Klinisch therapeutische Wochenschrift*, No. 27, 1903.

344. **Somers.** The effect of erysipelas upon atrophic rhinitis, with report of case. *Med. News*, August 29, 1903.

345. **Braeckert.** Paraffin injections in the treatment of ozæna. *La presse oto-laryngologique*, vol. 1903, part 6.

346. **Alexander.** The relationship of ozæna to pulmonary tuberculosis, with remarks on the diagnosis of ozæna. *Arch. f. Laryngol.*, vol. xiv., S. 1.

343. According to the author, diagnosis of ozæna can be made from the specific odor. After one or two applications of electrolysis the fœtor has been diminished in one hundred cases, and in cases which were not too old it has been entirely relieved. In the electrolysis the electrode was forced into the middle turbinate, the negative was placed in the anterior part of the septum in the same side, and a corrosion from 5 to 10 M. A. was allowed to take from five to ten minutes. If the odor returns after a few months, renewed electrolysis is indicated.

WANNER.

344. A male, aged thirty-eight years, had since his tenth year an intensely fœtid odor, and blocking the nose with large greenish crusts, after removal of which the turbinats were found atrophic. After a slight blow over the right eye erysipelas developed, involving the entire face and neck and the nasal and pharyngeal mucous membrane with abscesses in the upper and lower lids, and suppuration of the lateral cervical glands. After the erysipelas had run its course, it was found that the ozæna and the crusts had entirely disappeared. While, later on, the nasal mucous membrane remained somewhat atrophic in patches, it was normal in the upper pharynx.

M. TOEPLITZ.

345. The author injects a paraffin which has become fluid at 45° C., underneath the mucous membrane of the turbinate. He considers this temperature to be the most advantageous, because paraffin becomes hard very slowly, and on account of the low temperature the danger of phlebitis is lessened. The method is explained and two case-histories are described. The histological condition of the mucous membrane before and after the paraffin injections is described and the curative effect of the procedure is warmly praised.

BRANDT.

346. The author emphasizes his standpoint as to the ozæna question, which he regards in the sense of Fränkel—as an atrophic process following hypertrophic catarrh of the nasal mucous membrane, in which a non-specific fœtor develops through bacterial disintegration of the discharge. The ozæna may be associated with localized suppurations; generally it is not. Neither the pathological nor the bacteriological conditions give positive diagnostic features.

Two hundred phthisis patients were examined, and in only one was the typical ozæna present. Six cases presented presumably healed ozæna, 9 showed marked atrophy without ozæna, 5



moderate atrophy without cause, and in 11 the atrophy was caused by marasmus and disturbance of nutrition.

In 50 patients who applied to the dispensary on account of ozæna, pulmonary phthisis was present in 22; 7 were suspicious, 4 had other pulmonary diseases, and 17 had healthy lungs. In other words, in ozæna we have a disposition to pulmonary tuberculosis. This is, according to the author, due to the imperfect function of the ozæna-nose as a filter for air germs, as a heater and moistener of the respiratory air; also the fact that the air germs find a suitable nidus in ozæna discharge. In the discharge of 7 cases of ozæna, so-called "acid-fast" bacilli were found which resembled the tubercle bacillus. If these bacilli should get into the sputum, they might lead to an erroneous diagnosis of tuberculosis.

ZARNIKO.

d—TUMORS OF THE NOSE.

347. **Royet.** Mental disturbance due to the unsuspected presence of mucous polyps in the nose. *Le progrès médical*, 1903, No. 33.

348. **de Ponthière.** A case of distension of the nasal bones by enormous and numerous fibromyxomas of the nasal cavities. *Ann. des mal. de l'or., du lar.*, 1903, 3.

349. **Brown.** Cases of sarcoma of the nose. *The Laryngoscope*, August, 1903.

350. **Clark.** Nasal polypi: A study of one hundred and forty-seven cases. *Boston Med. and Surg. Journal*, July 2, 1903.

347. A man thirty-eight years of age had been for three years in a constant state of anxiety, with auditory hallucinations, mental and bodily depression, with even suicidal thoughts. Immediate recovery on removal of the nasal polypi, which were, however, localized to the middle meatuses and had produced no symptoms.

OPPIKOFER.

348. A complete myxomatous degeneration of both upper turbinates which had existed for years and had caused the nasal bones to be widely separated from one another—a distance of  $5\frac{1}{2}$  cm. The patient was forty-five years of age.

ZIMMERMANN.

349. In Cases 1 and 2 the tumor never recurred; in the latter it sprang from the perpendicular plate of the ethmoid. In Case 3, a man æt. twenty-one, the tumor completely filled the left nasal cavity, pushing the septum over to the right and distending the nostril; it flattened that side and produced a partial frog

face. It filled posteriorly the post-nasal cavity and pressed the soft palate downward. The tumor was sessile; it had grown from the inferior and middle turbinates and the posterior part of the vault above, was further attached to the upper part of the left palate bone, body of the sphenoid, posterior end of vomer. The inferior and middle turbinates and a portion of the body of the sphenoid were almost entirely rarefied. BROWN first removed twelve pieces of the tumor by means of snare and scissors and operated upon it also forty-nine times with the electro-cautery, thus removing the greater portion of the tumor, except a large piece attached to the vault of the naso-pharynx and the posterior end of the septum, which was removed under chloroform with the screw snare. After this, twenty-five other electro-cautery operations were performed upon parts of the tumor not entirely removed—chiefly in the turbinal region. Complete recovery took place with restoration of smell and excellent cosmetic result.

M. TOEPLITZ.

350. Of 146 cases, 107 were in both nostrils, 19 in the left and 20 in the right only; 76 in males and 70 in females; more than half of the cases, 78, between the thirtieth and fiftieth year of age, 20 between twenty and thirty, and 29 between fifty and sixty, 1 at thirteen, and 1 at seventy-eight. In 37 cases a deformity of the septum was found, which might have indirectly brought them on. Of 49 cases with suppuration from an accessory sinus, 1 from the maxillary antrum only, 11 from the ethmoidal only, 11 from the ethmoidal and the antrum, and 29 probably originated from the ethmoidal. A fifth of the cases were due to local vasomotor disturbance. The symptomatology, sequelæ, treatment, and prognosis are also considered.

M. TOEPLITZ.

#### 2.—DISEASES OF THE ACCESSORY SINUSES.

351. **Gilbert.** Mucocoele of the anterior ethmoid cells. *Ann. des mal. de l'or., du lar.*, 1903, 3.

352. **Yankauer.** An unusual symptom of empyema of the antrum of Highmore. *Med. Record*, Aug. 15, 1903.

353. **Krebs.** Paralysis of the trochlearis nerve in suppurations of the maxillary antrum. *Therap. Monatshefte*, Sept., 1903.

354. **Onodi.** Opening of the maxillary antrum from the middle meatus. *Arch. f. Laryngol.*, vol. xiv., p. 154.

355. **Weinberger.** On transmitted tuberculosis of the antrum of Highmore. *Arch. f. Ohrenheilk.*, 1903, part 4.

356. **Luc.** My last improvements in the treatment of chronic sinus disease of the face. *La presse oto-laryngologique*, vol. 1903, part 5.

357. **Onodi.** On cavities in the frontal bone. *Arch. f. Laryngol.*, vol. xiv., p. 375.

358. **Hansen and Pluder.** A case of real duplication of the frontal sinus. *Arch. f. Laryngol.*, vol. xiv., p. 404.

359. **Eschweiler.** The radical operation for frontal empyema, after Killian. *Sitzungsber. d. Niederrhein. Gesellsch. f. Natur- u. Heilkunde*, July 13, 1903.

360. **Blondiau.** Curious course of a revolver bullet—penetration of the bullet into the cranial cavity across the frontal sinus. *Arch. internat. d'otol.*, etc., 1903, p. 937.

361. **Onodi.** The relation of the optic nerve to the sphenoid cavity, and especially to the most posterior ethmoid cells. *Arch. f. Laryngol.*, vol. xiv., p. 360.

351. A small tumor as large as a nut was taken for a tumor of the lachrymal sac on account of the symptom of epiphora and its situation at the inner angle of the eyelids. The operation shows that a mucocoele existed of an isolated ethmoid cell, which was closed towards the nose. Recovery after primary suture.

ZIMMERMANN.

352. A man, æt. forty-eight, with both lower turbinates swollen, showed, after cocainization, a large growth in the left nasal side under the middle turbinate. It extended  $2\frac{1}{2}$  cm over the middle turbinate, across from the lateral wall in the shape of a polypus, and was covered with smooth mucous membrane and large dilated veins. There was pus on the nasal floor, and on incision two drachms of pus escaped. The tumor then collapsed completely. There existed either a congenital absence of the bony wall or a necrosis thereof,—a very rare condition.

M. TOEPLITZ.

353. Immediate appearance of the ocular lesion (interference of motility downwards, diplopia) after the onset of the suppuration of the antrum of Highmore. The ocular symptoms disappeared after opening the cavity; the paralysis was cured on cessation of the discharge from the antrum.

BRUEHL.

354. Siebenmann, as is well known, proposes to break through the middle meatus into the maxillary antrum with the small finger, and thus produce a large opening. ONODI, instead of the small finger, uses the dilating trochlea, with which he can easily make an opening 2 cm broad into the middle meatus, through which the cavity can be easily cleansed and tamponed.

ZARNIKO.

355. WEINBERGER describes a case of tuberculous disease of both superior maxillary antrums from extension of a tuberculosis of the buccal cavity, especially of the superior maxillary after perforation of the bone in the canine fossa. The mucous membrane of the maxillary sinus contained microscopically visible giant cells, caseation, and epithelioid cells. Tubercle bacilli were not discovered.

PIFFL.

356. These are the latest experiences in the chapter on Nasal Pathology which LUC presented at Washington in the Congress of the American Laryngological Society:

1. Maxillary sinus: Surgical treatment should be limited to cases of chronic suppuration. Purulent sinusitis should be distinguished when it is produced and kept up by inflammation of the degenerating mucous membrane from empyema of the Highmore antrum resulting from caries of the teeth, or from a transmitted inflammation of the frontal sinus in which the mucous membrane remains healthy for a long time. If in the last case the source of infection has been removed, simple irrigation of the antrum of Highmore suffices for a cure. A radical operation is undertaken only after repeated puncture of the maxillary antrum from the lower meatus and repeated irrigations. The radical operation consists in the making of two large bony defects—one in the anterior wall, which is later closed; the other, in the inner or nasal wall, which preserves a broad communication with the nasal cavity. The latter demands the removal of a large part of the middle and inferior turbinates. The results are unexpectedly good.

2. Frontal sinus: Killian's method is warmly recommended in cases of abnormally large sinuses and where the ethmoid cells are involved. In a small sinus, and where the ethmoid cells were healthy, the author has obtained satisfactory results with the Ogston-Luc method.

3. Ethmoid cells: A new method for eradicating the ethmoid cells is described with the aid of a peculiarly constructed forceps with broad and horizontally placed ends. The greater part of the middle turbinate, the fungous mucous membrane, or myxoma can be removed with facility. In the first sitting, as many as possible of the mucous polyps are removed with the cold snare. In the second sitting, after sufficient cocaineization, with this forceps the posterior end of the middle turbinate is grasped and evulsed. The procedure is repeated three or four times before

the bleeding makes an interruption necessary. The entire middle turbinate is thus resected. Below it, fungous and myxomatous masses are found which are easily removed with the forceps. All ethmoid cells are opened, and then finally the anterior lower wall of the sphenoid cell is broken into, and recovery takes place after two to three sittings. Relapses are rare and easily treated as cavities, and angles are corrected.

4. The sphenoidal sinus can be exposed by the rhinoscopic path and on forming an artificial defect. The method selected depends upon the size of the nose and the associated disease of the maxillary sinus. If the antrum of Highmore is healthy, one can proceed rhinoscopically, as under 3. After removal of the ethmoid cells the sphenoid cell is easily accessible. The opening is made as large as possible. If the maxillary antrum is diseased, the sphenoid cavity can be opened up through it (Jansen, Luc, Foret), a method which can be practised in marked deflections of the nose even if the antrum of Highmore is healthy.

BRANDT.

357. A careful description of the condition of the frontal sinus in thirty skulls, illustrated with numerous photographs. The first variety described is interesting, where the anterior ethmoid vessels and the nerves of the same name are situated in a half channel in the bottom of the frontal sinus or in an orbital ethmoid cell. This favors an extension of inflammation of these cavities to the orbit and to the cranial cavity.

ZARNIKO.

358. In a cadaver the frontal sinus was found very large, excepting towards the squama, towards the zygomatic bone, and towards the orbit. The other was found just as large, but completely divided into two parts by a sagittal partition—both emptying side by side into the common nasal frontal duct.

ZARNIKO.

359. Report of three patients with chronic empyema of the frontal sinus, which were operated on with good success after the method of Killian. (Detachment of the trochlea facilitates operation.)

BRUEHL.

360. A revolver was shot off at a distance of 75cm from a man seventeen years of age. The point of entrance corresponds to the right frontal sinus. The X-ray picture showed that the bullet divided into two parts at the anterior and posterior walls of the sinus, then changing its course continued along the inner



side of the roof of the skull upwards, and remained at the top of the skull without causing symptoms or injuring the brain. The smallest piece of the bullet did not enter into the frontal sinus, but was found 2cm above the point of entrance, between the skin and the anterior wall of the sinus. The operation consisted in the removal of the bony fragments from the frontal sinus and the extraction of a small part of the bullet. Recovery, without reaction.

OPPIKOFER.

361. Twenty cadavers were examined. In 6 cases, on both sides the most posterior ethmoid cell was situated in the small wing of the sphenoid, and in 10 cases it was present only on one side; in 5 cases the sphenoidal cavities extended into the small sphenoid wing.

In these 6 cases, where the most posterior ethmoid cells extended on both sides into the small sphenoid wing, an intimate connection existed between it and the optic nerve, as it formed the marginal wall of the optic cavity; also, in 2 cases, the lower wall, and in 2 other cases, the wall of the optic sulcus. In 3 half skulls the most posterior ethmoid cells formed the walls of the optic canal and of the optic foramen. The wall of the sphenoid is usually, at the level of the optic foramen, as thin as paper. The wall of the most posterior ethmoid cell is just as thin when it forms the wall of the optic canal. Sometimes there are differences between the two sides. This most interesting condition is illustrated with 9 photograph illustrations.

ZARNIKO.

*f.*—OTHER DISEASES OF THE NOSE.

362. **Dunbar.** On the etiology and specific treatment of autumn catarrh. *Berliner klin. Wochenschr.*, No. 28, 1903.

363. **Immerwahr.** On hay-fever and its treatment with Dunbar's pollen antitoxine. *Berliner klin. Wochenschr.*, No. 28, 1903.

364. **Mayer.** The cause and specific treatment of hay-fever; a preliminary report on the use of the toxines and antitoxines of Professor Dunbar. *N. Y. Med. Journ. and Phila. Med. Journ.*, Aug. 8, 1903.

365. **Stowell.** Hay-fever: A cause and a cure. *N. Y. Med. Journ. and Phila. Med. Journ.*, Sept. 5, 1903.

366. **Baurowicz.** The wandering of a foreign body. *Arch. f. Laryngol.*, vol. xiv., p. 187.

367. **Helot.** On primary nasal diphtheria. *Ann. des mal. de l'or., du lar.*, 1903, 1.

368. **Wittmaack.** The treatment of lupus of the nose with pyrogallie acid. *Münch. med. Wochenschr.*, 1903, No. 31.

369. **Treitel.** Syphilitic necrosis of the superior maxillary bone. *Arch. f. Laryngol.*, vol. xiv., p. 394.

370. **Streit.** On the occurrence of scleroma in Germany. *Arch. f. Laryngol.*, vol. xiv., p. 257.

371. **Lichthorn.** A case of rhino-scleroma. *Inaug.-Diss.*, Berlin, 1903.

362. The author has extended his well-known investigations on hay-fever to those of autumn catarrh, a peculiar form of hay-fever observed in North America. Hay-fever, according to the author, is due to the pollen toxine of various plants. This toxine is different from that causing ordinary hay-fever. Curiously, the antitoxine obtained from the pollen toxine of the Gramineæ neutralizes that obtained from the pollen toxine of the Solidago.

MUELLER.

363. Personal experiments lead the author to the following conclusions: Dunbar's pollen antitoxine is an excellent means to stop the beginnings of hay-fever, if one remains in close rooms, and especially if the weather in June to the time of the sprouting of the grass is cloudy and rainy. If, however, one is forced in June as in other times of the year to be much on the street, take long railway journeys, and go into the country, the pollen antitoxine in its present method of application is only a means to treat the unpleasant symptoms of hay-fever, which, however, is much more efficacious than any other medicament, but cannot be regarded as an infallible specific.

MUELLER.

364. Dunbar found the hay-fever poison as a soluble toxine in the starch bodies of the Gramineæ. By injecting the toxine prepared from the pollen of rye into animals, a serum was produced. MAYER dropped a mixture of equal parts of normal horse serum and of pollen toxine into one eye, and one drop of a mixture of equal parts of antitoxine and pollen toxine into the other eye. In the so-called spring catarrhs there occurred a reaction in the first eye, while the other remained normal; the reaction was relieved by the antitoxine. There was an absolute failure to react in the autumnal cases, and no reaction, except in one case, in the control cases. One drop of the serum is sufficient to neutralize the effect of twenty drops of the toxine. The toxine for the autumnal variety is yet to be found.

M. TOEPLITZ.

365. Hay-fever is a disease of the nervous system, irritated by the actinic rays of the sun, which are strongest at the hay-

fever season, setting up a reflex through the eye, the ciliary nerves through the lenticular ganglion being connected with the nasal ganglion, or by the connection of the Gasserian ganglion with other branches of the trifacial nerve. The treatment consists in the wearing of smoked glasses, and is particularly adapted to the early summer type.

M. TOEPLITZ.

366. After an attempt at suicide: The revolver bullet passed through the chin and into the upper jaw, and remained lodged in the region of the left frontal process. Purulent discharge of the nose and occlusion of the left half of the nose for four years. The bullet was detected imbedded in granulations in the middle meatus. Four weeks later, it had descended to the lowest part of the meatus and could be easily removed.

ZARNIKO.

367. Based on two cases of primary nasal diphtheria, one with severe general disturbances, and the other with an apparently mild cause, HELOT states that the diagnosis of diphtheria cannot depend upon the simple bacteriological examination; but if the forms which are morphologically similar to the diphtheria bacilli are to be found, experiments on doves should be made, and on the result of these should the diagnosis depend.

ZIMMERMANN.

368. Pyrogallic acid has a number of advantages over lactic acid, especially that the inflammatory reaction is less. After previous surgical treatment, gauze strips were impregnated with a 10 to 20 % ointment and packed on the diseased areas and left for one day. The treatment has frequently to be repeated after longer intervals.

SCHEIBE.

369. A piece of bone removed by the author consisted of the alveolar process, consisting of the canine and first premolar teeth, as well as the part of the canine fossa lying directly above. A portion, with the second incisor tooth, was also removed. Diagnosis: syphilis. Literature given.

ZARNIKO.

370. In this monograph, all of the cases of scleroma which have become known in Germany are given. These are divided into three groups: (a) Of the cases thus far published: (1) with certain diagnosis, 18; (2) with not an absolutely sure diagnosis, 4; (b) insufficiently published cases, 10; (c) cases published as scleroma, in which the diagnosis, however, cannot be confirmed. Excepting three cases, all the patients came from East Prussia

and Silesia, and chiefly from the country or the small cities. They were located about two infected areas. Unquestionably many cases of scleroma were overlooked, as their number in Germany is surely much greater than those of the reports. There is great danger that the infection will extend and that entire Germany will slowly be invaded. Hence energetic means are in order. These should consist as follows:

1. Scleroma should be reported.
2. With the aid of the general physicians, or with special committees, the infected areas should be carefully investigated.
3. Those suspected of scleroma should be in the charge of physicians, and if the diagnosis has been confirmed they should be isolated in special homes for scleroma patients.

ZARNIKO.

371. A case of rhino-scleroma is reported from Frankel's clinic. A man twenty-six years of age, from Warsaw; though the middle ear appears to have been also affected, an examination of the ears was not made.

BRUEHL.

g.—NASO-PHARYNX.

372. **Loewenberg.** On the association of deformities of the thorax with pharyngeal hypertrophies. *Deutsche mediz. Wochenschr.*, No. 29, 1903.

373. **Barth.** Hypertrophy of the pharyngeal tonsil in soldiers, and its relation to hypertrophic rhinitis and chronic pharyngitis. *Arch. f. Laryngol.*, vol. xiv., p. 82.

374. **Weil.** On the operation for adenoids. *M. f. O.*, 1903, No. 7.

375. **Pugnat.** Some complications of adenoid vegetations. *Revue médicale de la Suisse romande*, 1903, p. 611.

376. **Roepke.** A case of foreign body in the larynx and in the trachea. *Arch. f. Laryngol.*, vol. xiv., p. 189.

377. **Senator.** A case of spindle-cell sarcoma in the naso-pharynx of a child five years of age. *Deutsche med. Wochenschr.*, No. 27, 1903.

372. In order to preserve his priority, LOEWENBERG has translated a chapter from his book on adenoid tumors of the naso-pharynx, Paris, 1879, in which the changes in the thorax associated with adenoid vegetations are described. The author believes that the pectus carinatum, just as well as the depressed thorax, can be referred to the occluded nasal respiration from adenoids during the developmental period of the thorax, and that thus the lung and the thorax come into a condition of negative pressure and sink in when the diaphragm sinks during inspiration, in order

to sufficiently ventilate the lung. If the occlusion is not corrected, gradually a permanent, flat, depressed thorax results.

NOLTENIUS.

373. The author defines pharyngeal hypertrophies according to their size, in four groups. Of 561 recruits: Group I., 32 %; II., 36.8 %; III., 21.4 %; IV., 9.8 %.

Pharyngeal hypertrophy favors hypertrophic rhinitis, especially hypertrophy of the posterior ends of the turbinates. Hypertrophy of the palatal tonsils occurs very much more rarely than that of the pharyngeal tonsil (10 %); chronic pharyngitis in 30-40 %, dry pharyngitis in 2 % of the cases. In pronounced hypertrophy of the pharyngeal tonsil a well-marked vault of the palate was present.

ZARNIKO.

374. The author operates rarely under general anæsthesia as a rule, but under local cocaine anæsthesia, with Beckmann's knife. If parts remain suspended, these are removed with forceps and with snare. After-hemorrhages are corrected by digital examination with the finger. Remnants which remain after a number of weeks are removed with the snare through the nose under adrenalin cocaine anæsthesia.

PIFFL.

375. The author reminds the practising physician of the well-known fact that adenoid vegetations have not only an influence on the respiratory organs and on the ear, but also on the nervous system and on the digestive apparatus.

OPPIKOFEK.

376. In one of the four cases reported, the pharyngeal tonsil which had been cut away dropped into the larynx. The patient, who was eleven years old, was thereupon stood upon his head, the doctor gave him a good blow on the back, and the pharyngeal tonsil fell out.

ZARNIKO.

377. SENATOR describes a cauliflower-like tumor which was suspended from the naso-pharyngeal cavity into the pharynx of a boy five years of age. On the attempt to remove it with the Gottstein curette, the tumor broke into a number of pieces which had evidently been united by a common pedicle. The hemorrhage was unusually slight. A microscopical examination was made by Weigert. The tumor consisted principally of spindle-cells with a few round cells. The intracellular substance was very slight, so that the tumor would probably be regarded as a cellular fibrosarcoma.

NOLTENIUS.



## SOFT PALATE, PHARYNGEAL AND BUCCAL CAVITIES.

378. **Bentzen.** On the etiology of the high palate. *Arch. f. Laryngol.*, vol. xiv., pp. 203-256.
379. **Strebel.** On the use of light in the treatment of chronic pharyngeal catarrhs and other pharyngeal processes. *Arch. f. Laryngol.*, vol. xiv., p. 99.
380. **Baumgarten.** Aneurism of the ascending pharyngeal artery. *M. f. O.*, 1903, No. 7.
381. **Glas.** On the pathology of tuberculosis of the palatal tonsil. *Wiener klin. Wochenschrift*, No. 36, 1903.
382. **Escomel.** The palatal tonsils and their contents in tuberculosis. *Revue de méd.*, 1903, p. 459.
383. **Theisen.** A case of lipoma of the tonsil. *The Laryngoscope*, August, 1903.
384. **Neufeld.** A case of deep-seated pharyngeal sarcoma. *Arch. f. Laryngol.*, vol. xiv., p. 182.
385. **Prokunin.** On the surgical treatment of malignant pharyngeal tumors. *Chirurgija*, vol. xiii., No. 76, April, 1903.
386. **Swain.** The lymphatic system and the tonsils. *Amer. Jour. Med. Science*, July, 1903.
387. **Fisher.** Report of two cases of ulcerative angina and stomatitis, associated with the fusiform bacillus and the spirillum of Vincent. *Amer. Jour. Med. Science*, Sept., 1903.
388. **Amberg.** Sublingual growths. *Amer. Jour. Med. Science*, Aug., 1903.

378. The views of the various authors on the etiology of the high palate are fully given, and the present difference of opinion as existing between Bloch and Koerner on one side and Siebenmann on the other. His own investigations consist of an examination of 394 individuals. There is no definite relationship between the height and the breadth of the normal palate. The absolute height increases up to the twenty-fifth year, especially after the appearance of puberty, then diminishes. The breadth increases steadily, chiefly in the period after the second dentition. Men have a broad, women a narrow and relatively high palate. The palate in leptoprosopia is high; in chamæprosopia, narrow after change of teeth. Before the change of teeth it is reversed. The V-shaped palate is not so rare in individuals who do not suffer from a septal deviation, nor in mouth-breathers. It is principally present in high palates. Adenoid vegetations occur in rachitic individuals with leptoprosopia twice as frequently as in chamæprosopia. Individuals with adenoid vegetations, and mouth-breathers, have a higher palate than nasal-breathres. Rachitis has no appreciable influence on the height of the

palate, if the condition is associated with mouth-breathing and adenoid vegetations. There is a causative relation between mouth-breathing and high palate. The V-form palate is more frequent with adenoids in mouth-breathing than in normal; it is more frequent in males than in females, more frequent in leptoprosopia than in chamæprosopia, more frequent in a high than in a low palate.

The septal deviation occurs principally in leptoprosopia. Adenoid vegetations appear to have no influence upon it.

ZARNIKO.

379. STREBEL has had very good results in chronic catarrhal processes by the action of cold light on the pharyngeal mucous membrane. The effective rays are those from ultraviolet to blue. The apparatus is described.

ZARNIKO.

In a woman, forty-two years of age, who consulted the dispensary on account of snoring, a tumor was found in the right lateral pharyngeal wall, which varied in size and pulsated, and, from its location, could only belong to the ascending pharyngeal artery. The patient had no knowledge of its presence, as she had never had any discomfort.

PIFFL.

381. After a review of the literature of the subject, two cases of primary tonsillar tuberculosis and one case of miliary tuberculosis are reported. In the first case, the tonsil presented the unquestionable picture of tonsillar hypertrophy. In the course of the disease a retropharyngeal abscess appeared. In the second case, besides the diseased tonsil, a diseased focus was found on the vocal cord of the same side. The tonsil contained numerous tubercle bacilli. In the third case, the upper air passages were completely studded with nodules and extensive tubercular ulcers.

The cause was either inhalation or infection with the sputum. The possibility of infection with the laryngeal mirror is always possible.

The treatment of primary tonsillar tuberculosis is a radical removal with the tonsillotome or galvano-cautery.

Microscopic examinations enable the author to distinguish the various forms of tonsillar tuberculosis: 1, miliary; 2, sclerotic; 3, chronic ulcerous; 4, chronic granulating form. WANNER.

382. ESCOMEL examined the tonsils of twenty-five individuals who had died of general tuberculosis, and in twenty-one, tubercle bacilli were found. There were no ulcerations, so that the

diagnosis could not be made with the naked eye, but only with the aid of a microscope. Bacilli may be found in every portion of the tonsil mass, frequently in the depths of the crypts. The bacilli were found in three cases in the blood-vessels. In addition to the tubercle bacilli, there are on the surface numerous cocci, bacilli, fungi, which injure the epithelium in the places they enter and then facilitate the entrance of the tubercle bacillus.

The tonsils of eleven adults who were free from tuberculosis and died from other causes were also examined. Microscopically, no tuberculous changes were found, though in two, in the depths of the crypts, tubercle bacilli were present. The uvula in twenty-five tubercular and eleven non-tubercular patients showed normal conditions.

OPPIKOFER.

383. A girl, aged eight years, had been troubled for three years with a severe cough. A tumor, of the size of a small marble, was attached to the centre of the right tonsil by a rather long, thin pedicle, which came out of a tonsillar crypt. It was round, smooth, and of yellowish color. Microscopically it was a lipoma. Besides THEISEN'S case there are but six cases on record. These are given *in extenso* together with a complete review of the literature on lipoma of the nose and pharynx and the relative frequency of benign tumors of the tonsil.

M. TOEPLITZ.

384. A malignant pharyngeal tumor was suspected on account of a hard glandular swelling which appeared in the neck. Microscopic examination of one of these extirpated glands revealed sarcoma. Further course and autopsy revealed the diagnosis of deep-seated pharyngeal sarcoma.

ZARNIKO.

385. The paper treats of the malignant tumors of the oropharynx, and includes thirty-one cases of exclusively Russian surgeons', including three of the author's. The following conclusions are reached:

(1) The preceding tonsillotomy is unnecessary in the surgical treatment of malignant tumors of the pharynx and can be replaced by the lateral position of the patient with dependent head.

(2) The large vessels of the neck need not be first ligated, but the vessels which pass to the tumor can be ligated.

(3) In all cases of malignant disease of the oropharynx those parts of the neck must be exposed where the most frequently affected lymph glands are situated.

(4) There is no single operative method for all cases to be regarded as best. In general the incision must be so finished that

the operative field can be properly exposed and the tumor easily removed.

SACHER.

386. In a man, aged sixty-three years, the throat was gradually filling up without pain. Both faucial tonsils and the lingual were enormously enlarged. The swellings were very much reduced by arsenic, but returned to their former size when the treatment was interrupted, but finally remained large. In the hard palate a swelling appeared hanging down into the mouth with spots of pressure necrosis. The lymph nodes all over the body became enlarged. There was a swelling also in front of the left ear and one over the right mastoid. Death took place from exhaustion. This was a lymphadenoma; the first tissues affected were the tonsils as integral parts of the lymphatic system. In another case, a young man of twenty was suddenly stricken with acute Hodgkin's disease following a simple streptococcus tonsillitis. Death took place within six days. The function of the tonsils and the lymphatic ring are extensively discussed. Marked cases of acute inflammation of the pharyngeal tonsil are not so rare, and one case is cited *in extenso*, which took several months before the child recovered its former strength. It had no other symptoms than fever and swelling of lymph nodes in the neck at the angle of the jaw and farther down under the sterno-cleido-mastoid muscle. M. TOEPLITZ.

387. After a bacteriological description of the fusiform bacillus and the spirillum of Vincent, FISHER'S Case 1 is given as occurring in a young man, aged twenty, whose gums, a week after extraction of the last molar tooth on the left side of the lower jaw, had become hyperæmic, the site covered with an irregular superficial ulcer, the floor of which was composed of a rusty-gray membranous exudate. This condition continued for three weeks, when the tonsil and uvula became ulcerated. The exudate was easily removed, but readily re-formed and bled. Upon mild antiseptics the lesions disappeared after three weeks. Case 2, a woman aged thirty-six years, suffered from acute maniacal insanity; she was constantly moistening her lips with her tongue, which came in contact with her partially closed teeth, causing an irritation and abrasions along the edges of the tongue. This was soon ulcerated and covered with creamy exudate, which also appeared along the border of the lower gums. The scraping contained the fusiform bacillus and the spirillum of Vincent. This was a gangrenous stomatitis. M. TOEPLITZ.

388. A seven-month-old boy had a tumor under the tongue, 1 to 1.5cm in diameter and about 5mm in thickness, which had the appearance of a disk, was rather hard with a somewhat rough surface. The oral surface was pearly-white surrounded by a reddish margin, the centre was slightly depressed and showed some sloughing. It was perfectly separated from the tongue and was attached to the frenulum with a broad base. It had persisted for about four weeks, starting as a hard, white pimple, when the first teeth, the two median lower incisors, first appeared. It was easily removed with scissors. The affection seems to occur most frequently in southern Italy. AMBERG's case occurred in a baby from parents of American descent and is the first on record in the United States. Progressive cachexia, frequently associated with these tumors, was not seen. The structure of the growth is a product of an inflammatory process. The etiology of the affection is obscure.

M. TOEPLITZ.



## BOOK REVIEWS.

### III.—**Bericht über die Leistungen in der Ohrenheilkunde.**

Von Dr. BLAU. Sechster Bericht, 1901-1902, pp. 283. Price, M. 4 (\$1.00). Published by S. Hirzel, Leipzig.

This, the sixth, report covers the years 1901 and 1902. The well-recognized ability of the author in just this kind of work makes it unnecessary to say anything further in praise of this little volume. The judicious selection of the material, the practical arrangement of the subject-matter, and the lucidity and brevity of the abstracts make these reports models of their kind. The book will prove of great interest and profit to every otologist.

A. K.

### IV.—**Handbuch der Ohrenheilkunde.**

Von Professor KIRCHNER. Seventh Edition, 1904, pp. 272. Published by S. Hirzel, Leipzig. Price, M. 5.80 (\$1.40).

In this new (7th) edition of the text-book by Professor Kirchner in Würzburg, to keep pace with recent advances in Otology, the following chapters have been re-written and enlarged: Functional examination, diseases of the naso-pharynx, operative treatment of acute and chronic suppurative processes, and deafmutism. The style is clear, the book is short, yet sufficiently exhaustive for students and general practitioners, to whom it can be recommended.

A. K.

### V.—**Handatlas der Operationen am Schläfenbein.**

Von Professor GERBER, Königsberg, with 10 plates and 9 illustrations in the text. Published by J. F. Bergmann, Wiesbaden, 1904.

This atlas is designed, as stated in the preface, primarily as an aid to the young aural surgeon in his practical exercises on the cadaver and in his first operations. Though the operations have been frequently well described, suitable illustrations have hitherto been wanting. The various steps in the following operations are

portrayed. The simple mastoid (Schwartz), the complete exposure of the middle-ear cavities (radical operation, Stacke-Zaufal-Schwartz), the operation for suppuration of the labyrinth, for extradural and perisinuous abscesses, for cerebral abscess, for cerebellar abscess, and for sinus thrombosis. The illustrations contained on the ten plates are artistically drawn and beautifully reproduced. They may in general be said to serve their purpose. Some steps in the operations, such as the superficial ones, leave nothing to be desired. Others, however, which attempt to portray the deeper conditions, namely, those of the middle ear and of the semicircular canals, are not so successful, as plasticity is lost. Unquestionably for these conditions drawings fall short, as nothing can replace bone specimens, unless it be stereoscopic photographs of bone specimens, as in Trautmann's Atlas. An excellent and new drawing is to be found on Plate IX., showing exposure of sigmoid sinus, jugular bulb and vein.

The accompanying text treats briefly of the main symptoms, indications for operation, the technique and after-treatment. In addition, closure of a retroauricular opening, lumbar puncture, ligation of the jugular vein, and exposure of the jugular bulb are described. The atlas is unquestionably a very desirable addition to the library of the otologist, and as it fulfils its purpose can be strongly recommended. A. K.

**VI.—Otitis media der Säuglinge: Bakteriologische und anatomische Studien.** Von Dr. H. PREYSING, Leipzig. With 40 plates. Published by J. F. Bergmann, Wiesbaden, 1904.

This monograph fills a gap in otological literature. Though the macroscopic pathological changes in the middle ear of sucklings have frequently been described, accurate microscopical examinations have not been made. This fundamental work of Preysing gives us full information of the pathological changes in the ears of sucklings.

The microscopic conditions are excellently portrayed on forty plates.

The accompanying text divides the subject as follows: 1. Bacteriology of the otitis of sucklings; method of autopsy and pathological examination. 2. Normal anatomy; (a) tympanic mucous membrane; (b) embryonal myxomatous tissue in the tympanum; (c) glands in the tympanic mucous membrane; (d) dehiscence in facial canal; (e) semicircular canals. 3. Patho-

logical changes; (*a*) in the tympanic mucous membrane; (*b*) beginning of the inflammation in the mucous membrane; (*c*) thrombus formation in the mucous membrane of the tympanum and antrum; (*d*) pathological changes in the drum membrane; (*e*) action of paracentesis; (*f*) interference with the myxomatous involution by the otitis media; (*g*) absorption of the tympanic empyema; (*h*) tuberculosis of the tympanum; (*i*) disease of the bone and internal ear in sucklings' otitis.

The old statement that the suckling's ear cannot be examined otoscopically has been corrected by the reviewer. The autopsy findings consequently become more important if verified by examinations in the living. As regards the influence of sucklings' otitis on the gastro-intestinal tract, the author believes that the nutritive disturbances and the gastro-enteritis, if caused by a tympanic empyema, are the result of the absorption of toxic substances from the middle ear by way of the blood and lymph channels, and not of a direct infection with the infectious agents of the otitis media.

A. HARTMANN.

VII.—*Die Otosclerose*. By Dr. A. DENKER, Erlangen. Vol. iv. *Die Ohrenheilkunde des Gegenwart und ihre Grenzgebiete in Einzeldarstellungen*, herausgegeben von Dr. O. KOERNER, with 11 illustrations and 8 diagrams. Published by J. F. Bergmann, Wiesbaden, 1904.

Denker's monograph is exceedingly welcome. It contains all that is important on this subject; anatomy and physiology, macroscopic and microscopic pathology, etiology, functional examination, symptoms, course, diagnosis, treatment, and prognosis.

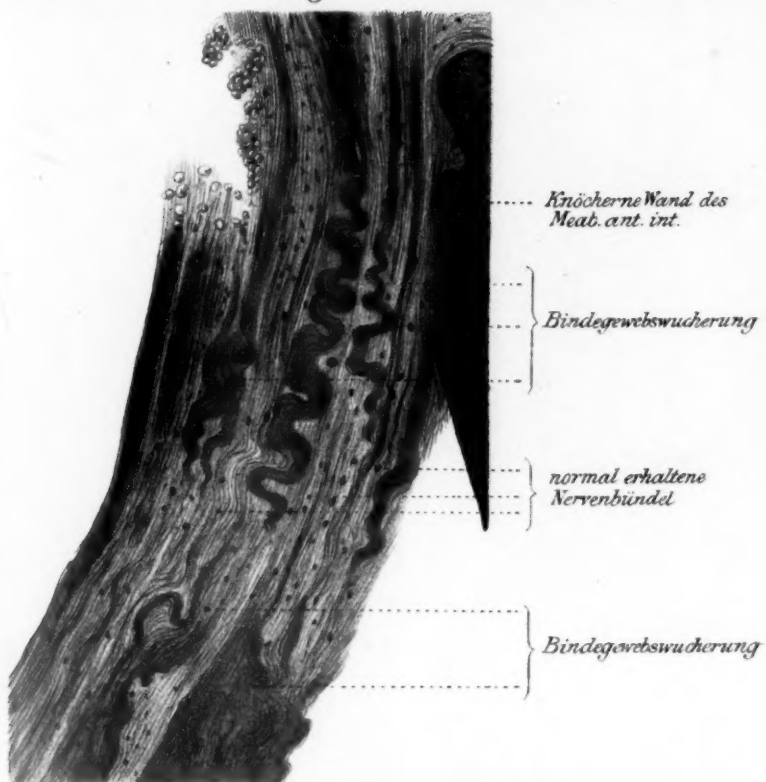
The functional examination follows the teachings of Bezold. From personal experience the author is convinced of the value of Gellé's test. Regarding Habermann's recently expressed opinion that syphilis is the cause of otosclerosis, Denker states that stapes-anchylosis should be more frequently observed as a "secondary affection," and that though syphilis affects men more frequently than women, otosclerosis is more common in women. Therapeutically the author has observed the favorable action of phosphorus, though he speaks of the possibility of phosphorus poisoning.

The book will serve as an incentive to all otologists for further investigations and help in disseminating knowledge of this affection among general physicians.

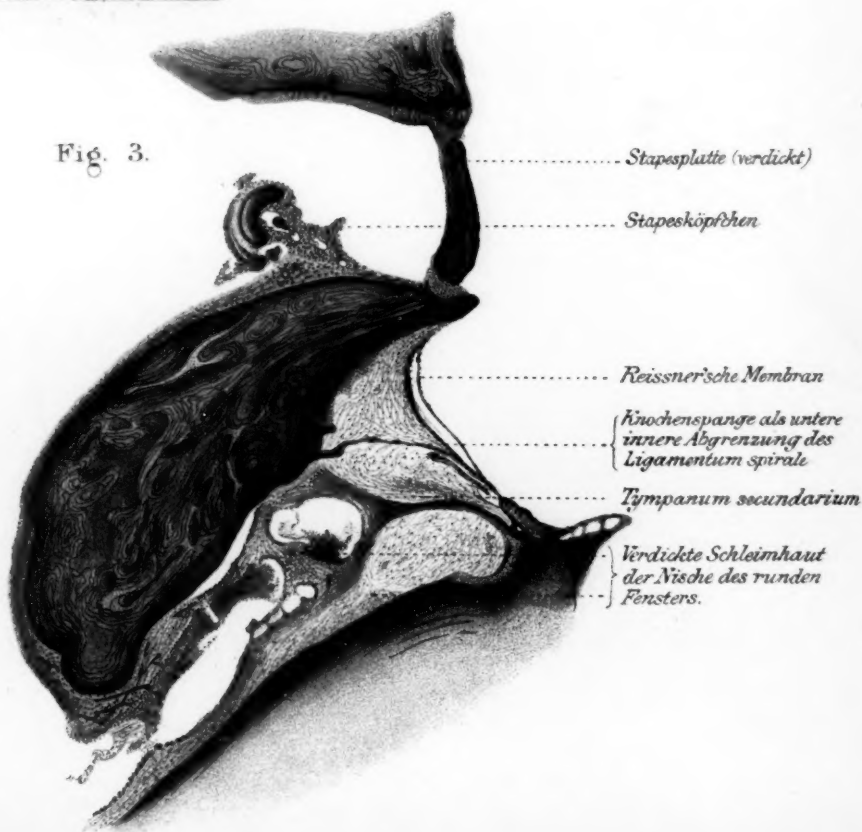
G. BRÜHL.



**Fig. 1**



**Fig. 3.**







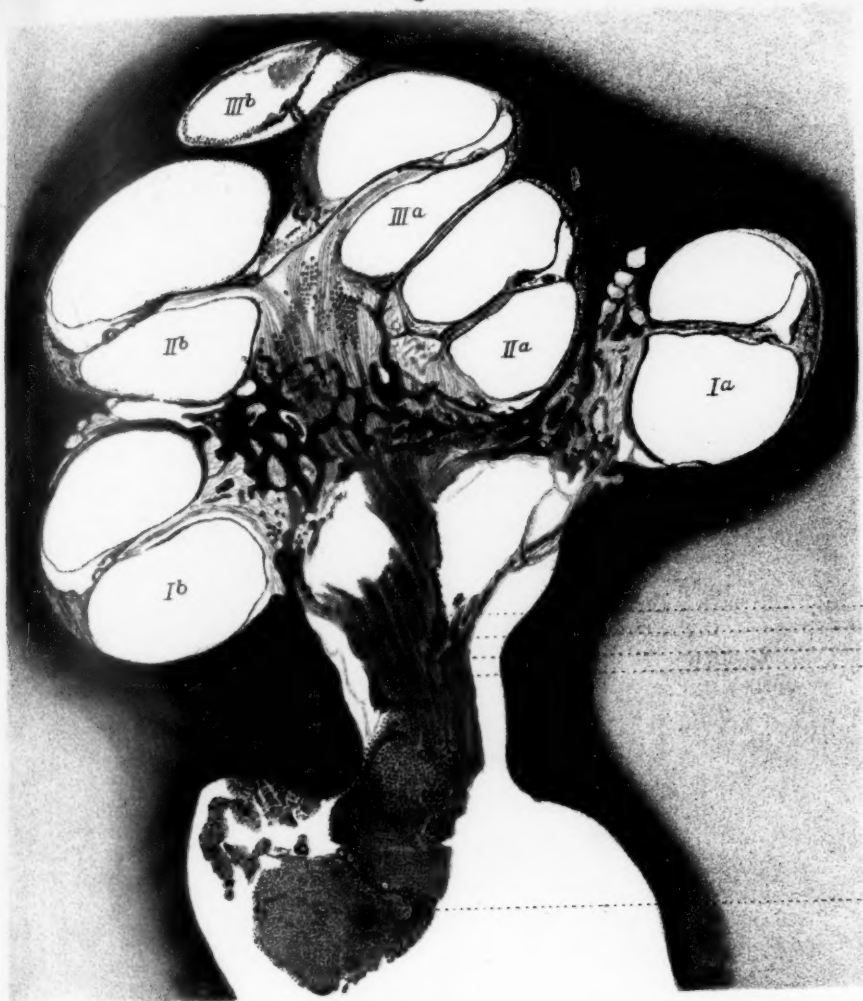
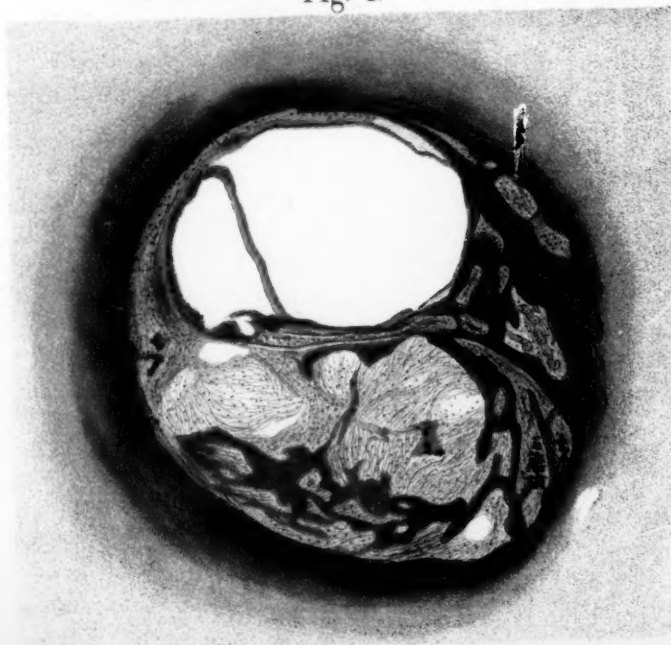


Fig. 4.



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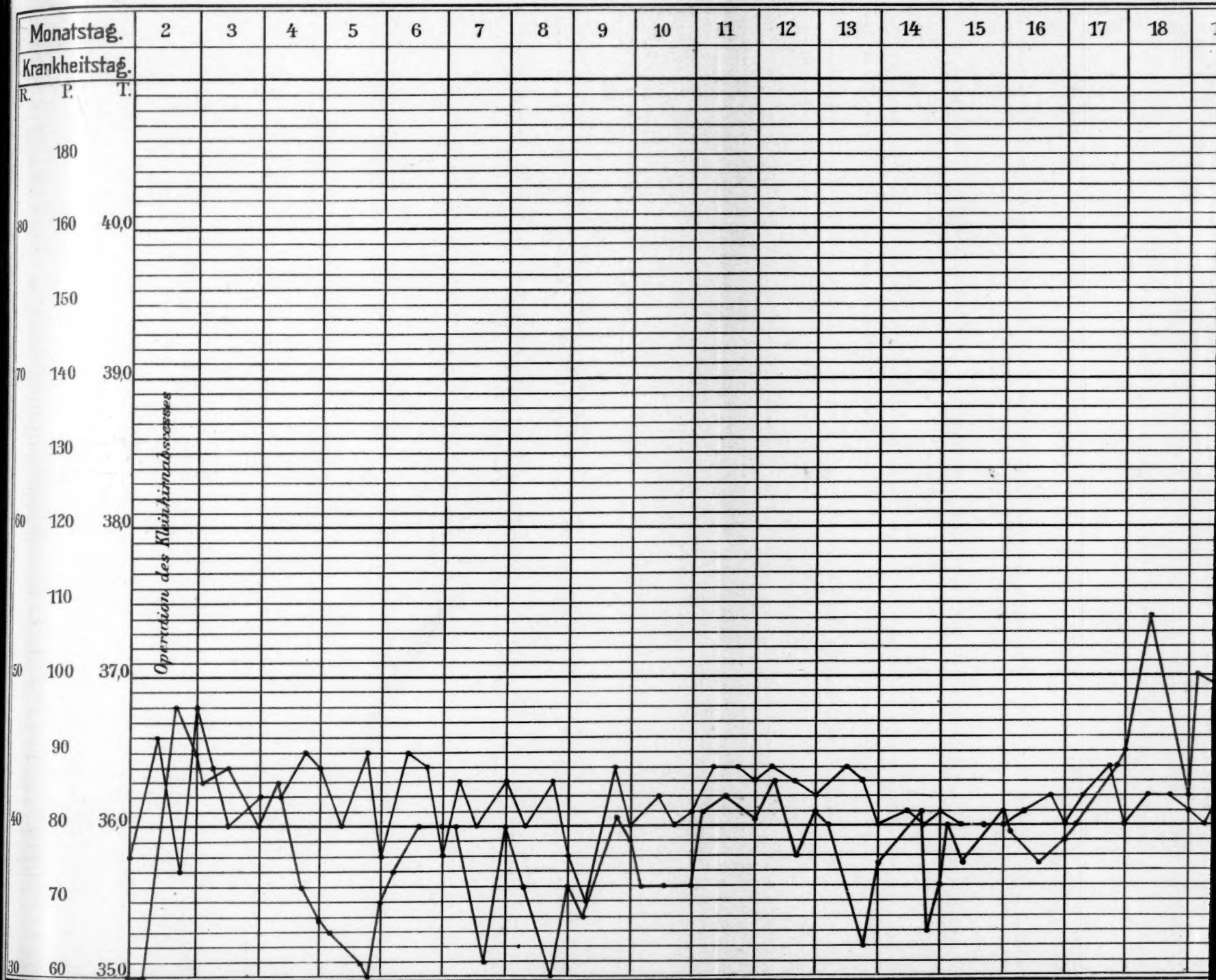
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Schw

Name: *Hermine Schneider*

Alter: *14*

1901 Monat: *November December*



Schwarz: Temperatur, Rot: Puls.

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